

Name _____

Key 2019.

Period _____

Date _____

Algebra 31 - Final Exam Review**Formula Sheet**

$$A = Pe^{rt}$$

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

$$A = P(1 + r)^t$$

$$A = P(1 - r)^t$$

$$S_n = a_1\left(\frac{1-r^n}{1-r}\right)$$

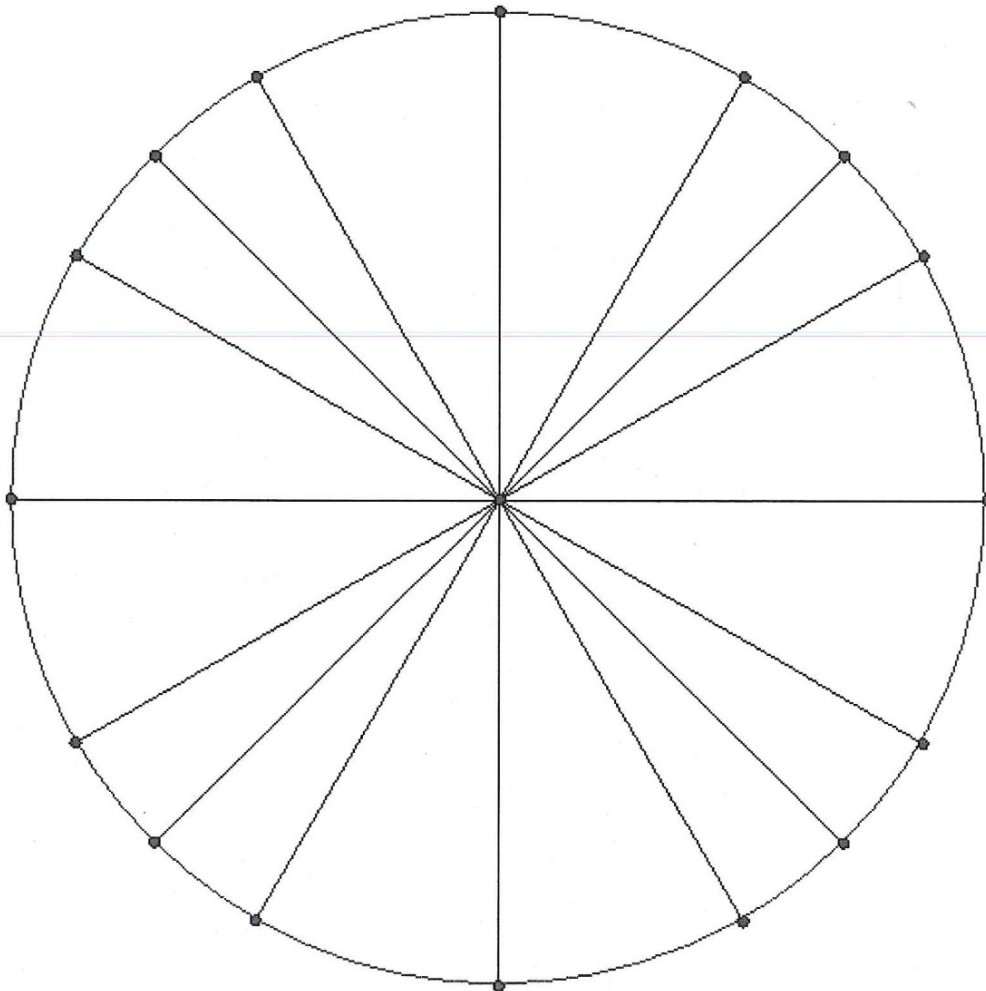
$$S_n = \frac{n}{2}(a_1 + a_n)$$

$$S_n = \frac{a_1}{(1-r)}$$

$$a_n = a_1 + (n - 1)d$$

$$a_n = a_1(r)^{n-1}$$

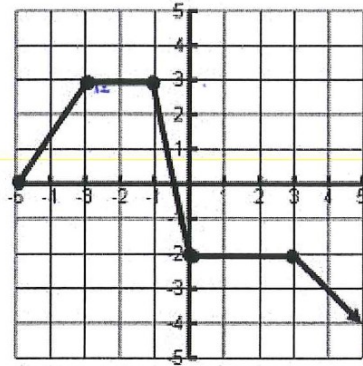
$$P = \frac{2\pi}{\omega} \quad \text{or} \quad \omega = \frac{2\pi}{p}$$



A. Functions (NON-CALC)

1) Use the graph of $f(x)$ at right to answer the following questions.

- a. $f(2) = -2$
- b. $f(x) = -2$ $(0, 3)$
- c. $f(-3) = 3$ $(-3, 3)$
- d. $f(x) = 3$ $(-3, -1)$
- e. Domain: $[-6, \infty)$ Range: $(-\infty, 3]$

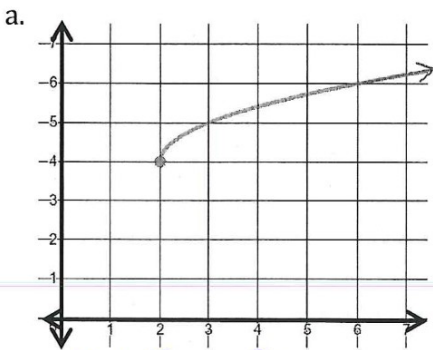


2) Given $g(x) = 2x^2 + 11x - 11$, find:

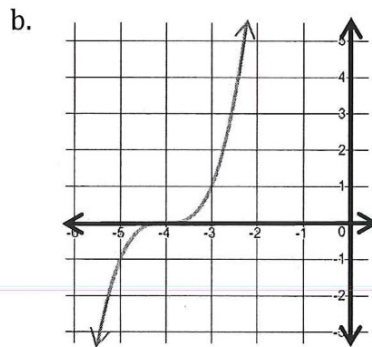
- i. $g(-3) = 2(-3)^2 + 11(-3) - 11 = 18 - 33 - 11 = -26$
- ii. $g(4) = 32 + 44 - 11 = 65$
- iii. $g(x) = -25$
 $-25 = 2x^2 + 11x - 11$
 $0 = 2x^2 + 11x + 14$
 $0 = (2x + 7)(x + 2)$
 $x = -7/2, -2$
- iv. $g(x) = -23$
 $-23 = 2x^2 + 11x - 11$
 $0 = 2x^2 + 11x + 12$
 $0 = (2x + 3)(x + 4)$
 $x = -3/2, -4$

B. Domain and Range (NON-CALC)

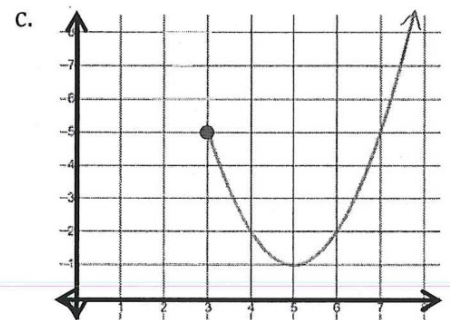
1) Find the domain and range of the graphs below.



D: $[2, \infty)$
R: $[4, \infty)$



D: $(-\infty, \infty)$
R: $(-\infty, \infty)$



D: $[3, \infty)$
R: $[-1, \infty)$

C. Transformations (NON-CALC)

1) Describe the transformations.

- a. $f(x) + 2$ Up 2
- b. $f(x - 3)$ Right 3
- c. $f(x) - 1$ Down 1
- d. $f(-x)$ Reflect over y-axis.
- e. $f(x + 1) - 3$ left 1, down 3
- f. $-f(x) + 2$ Reflect over x-axis, up 2.

2) State what the parent graph is and what transformations are being described.

a. $y = 2(x - 3)^2 + 1$

parent: $y = x^2$
Quadratic
stretch 2, Right 3
up 1

b. $f(x) = \frac{1}{2}|x + 5| - 6$

parent: $f(x) = |x|$
Compress 1/2 left 5
Down 6.

c. $y = \sqrt{x + 3} - 4$

parent: $y = \sqrt{x}$
left 3
Down 4.

new vertex (3, 1)

D. Polynomials

1. Perform the indicated operation. (NON-CALC)

a. $(2x^4 + 9x - 9) - (x^4 - 2x^2 + 4x - 8)$

b. $(x^4 - x^3 + x^2 - x + 1) + (x + x^4 - 1 - x^2)$

c. $(x^2 - 6y)(x^2 + 6y)$

d. $(w + 4)(w^2 + 6w - 11)$

e. $(x - 2)^3$

f. $(x + 4)(x - 6)(x - 5)$

g. $(8x - 2)(8x + 2)$

h. $(3x + 4)^2$

2. Factoring (NON-CALC):

a. $x^4 - 7x^2 + 12$

b. $2x^3 - 2x^2 + 3x - 3$

c. $3x^2 - 15x + 12$

d. $x^4 - 16$

e. $x^3 + 5x^2 + 4x + 20$

f. $5x^3 - 20x^2 - 25x$

g. $x^4 - 2x^2 - 24$

On attached
Page

3. Solving Equations (NON-CALC, except for g):

a. $4x^3 + 16x^2 - 9x - 36 = 0$

i. $24 + (x + 6)^4 = 25$

b. $x^3 + 5x^2 - x - 5 = 0$

j. $\sqrt{2x + 3} + 2 = 8$

c. $s^4 + 5s^2 - 6 = 0$

k. $4\sqrt[3]{2x - 8} = 8$

d. $x = \sqrt{5x - 6}$

l. $2(x - 2)^{\frac{2}{3}} = 50$

e. $-2(2x + 3)^3 = 54$

m. $12 - (x + 5)^3 = 76$

f. $2x^3 + 20 = 36$

n. $\log_9 3 = x$

g. $7^{3x} + 2 = 9$ (calc)

o. $\log_4(5x - 1) = 3$

h. $8^{2x} - 1 = 12$ (calc)

p. $(x^2 + 9)(x - 3)(x + 2) = 0$

4. **Imaginary Numbers:** Perform the indicated operation, and write in proper complex form.

a. $(3 + 2i)(4 - 5i)$

b. $(2 - 6i)^2$

c. $(3 + 2i) + (4 - 5i)$

d. $(11 + 8i) - (9 - 5i)$

e. $(11 + 8i)(9 - 5i)$

f. $(4 - 2i)(4 + 2i)$

on attached.

5. **Divide using synthetic division. SHOW WORK!**

a. $(x^3 - 4x^2 - 2x + 3) \div (x + 1)$

b. $(3x^4 + 2x^2 - 12x + 9) \div (x - 2)$

on attached.

6. **Find all zeros of the polynomial function. Then sketch the graph using zeros, multiplicity, degree, and end behavior (NON-CALC):**

a. $f(x) = x^4 + 4x^3 + 7x^2 + 16x + 12$

e. $f(x) = 2x^4 - 2x^3 - 3x^2 - 7x + 10$

b. $f(x) = x^3 - 8x^2 + 11x + 20$

f. $f(x) = x^4 + x^3 + 2x^2 + 4x - 8$

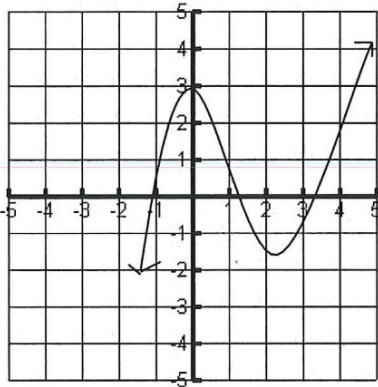
c. $f(x) = -(x - 4)^2(x + 3)^3(x - 1)(x + 7)$

g. $f(x) = -x(x - 2)^2$

d. $f(x) = -2x^3 - 6x^2 + 2x + 6$

on attached.

7. **What is true about the polynomial function whose graph is shown? (Circle all that apply)**



a) $f(x) \rightarrow -\infty$ as $x \rightarrow +\infty$ ~~X~~

b) $f(x) \rightarrow +\infty$ as $x \rightarrow -\infty$ ~~X~~

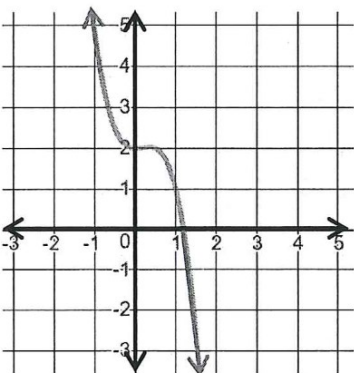
c) Leading coefficient is positive

d) Degree is even ~~X~~

e) Leading coefficient is negative ~~X~~

f) Degree is odd

8. **Which equation is the graph of the polynomial function shown?**



a) $f(x) = 3x^4 - x^2 + 2$

b) $f(x) = 3x^3 - x + 7$

c) $f(x) = -2x^4 + x^2 - 1$

d) $f(x) = -2x^3 + x^2 + 2$

← yint

$$1a) \begin{array}{r} 2x^4 + 9x - 9 \\ -x^4 + 2x^2 - 4x + 8 \\ \hline \end{array}$$

$$\boxed{x^4 + 2x^2 + 9x - 1}$$

$$b) \begin{array}{r} x^4 - x^3 + x^2 - x + 1 \\ + x^4 - x^2 + x - 1 \\ \hline \end{array}$$

$$2x^4 - x^3$$

$$c) (x^2 - 6y)(x^2 + 6y) \\ = x^4 - 36y^2$$

$$d) (w+4)(w^2 + 6w - 11)$$

$$\begin{array}{r} w^3 + 6w^2 - 11w \\ + 4w^2 + 24w - 44 \\ \hline \end{array}$$

$$w^3 + 10w^2 + 13w - 44$$

$$e) (x-2)^3$$

$$= (x-2)(x^2 - 4x + 4)$$

$$= \begin{array}{r} x^3 - 4x^2 + 4x \\ - 2x^2 + 8x - 8 \\ \hline \end{array}$$

$$\boxed{x^3 - 6x^2 + 12x - 8}$$

$$f) (x+4)(x-6)(x-5) \\ (x+4)(x^2 - 11x + 30)$$

$$= \begin{array}{r} x^3 - 11x^2 + 30x \\ + 4x^2 - 44x + 120 \\ \hline \end{array}$$

$$\boxed{x^3 - 7x^2 - 14x + 120}$$

$$g) 64x^2 - 4$$

$$h) (3x+4)(3x+4)$$

$$= \boxed{9x^2 + 24x + 16}$$

$$2a) x^4 - 7x^2 + 12$$

$$(x^2 - 4)(x^2 - 3)$$

$$\boxed{(x+2)(x-2)(x^2-3)}$$

$$b) 2x^3 - 2x^2 + 3x - 3$$

$$2x^2(x-1) + 3(x-1)$$

$$\boxed{(2x^2+3)(x-1)}$$

$$c) 3x^2 - 15x + 12$$

$$3(x^2 - 5x + 4)$$

$$\boxed{3(x-4)(x-1)}$$

$$d) x^4 - 16$$

$$(x^2 + 4)(x^2 - 4)$$

$$\boxed{(x^2+4)(x+2)(x-2)}$$

$$e) x^3 + 5x^2 + 4x + 20$$

$$x^2(x+5) + 4(x+5)$$

$$\boxed{(x^2+4)(x+5)}$$

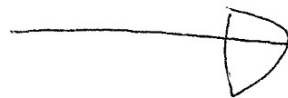
$$f) 5x^3 - 20x^2 - 25x$$

$$5x(x^2 - 4x - 5)$$

$$= \boxed{5x(x-5)(x+1)}$$

$$g) x^4 - 2x^2 - 24$$

$$\boxed{(x^2-6)(x^2+4)}$$



3) a) $4x^3 + 16x^2 - 9x - 36 = 0$
 $4x^2(x+4) - 9(x+4) = 0$
 $(4x^2 - 9)(x+4) = 0$
 $4x^2 - 9 = 0 \quad x+4 = 0$
 $x^2 = 9/4$
 $x = \pm 3/2, -4$

g) $7^{3x} + 2 = 9$
 ~~$7^{3x} = 7$~~
 ~~$7^{3x} = 7^1$~~
 $7^{3x} = 7^1$
 $x = 1/3$

b) $x^3 + 5x^2 - x - 5 = 0$
 $x^2(x+5) - 1(x+5) = 0$
 $(x^2 - 1)(x+5) = 0$
 $\pm 1, -5$

h) $8^{2x} = 13$
 $\log_8 13 = 2x$ OR $y_1 = 8^{2x}$
 $y_2 = 13$
 $\frac{1.234}{2} = x$
 $x = .617$

c) $x^4 + 5x^2 - 6 = 0$
 $(x^2 + 6)(x^2 - 1) = 0$
 $x = \pm \sqrt{6}, \pm 1$

i) $\sqrt[4]{(x+6)^4} = \pm 1$
 $x+6 = \pm 1$
 $x = -6 \pm 1 = -5, -7$

d) $x = \sqrt{5x-6}$
 $x^2 = 5x-6$
 $x^2 - 5x + 6 = 0$
 $(x-3)(x-2) = 0$
 $x = 3, 2$

j) $(\sqrt{2x+3})^2 = 6^2$
 $2x+3 = 36$
 $2x = 33$
 $x = 33/2$

e) $-2(2x+3)^3 = 54$
 $\sqrt[3]{(2x+3)^3} = \sqrt[3]{-27}$
 $2x+3 = -3$
 $2x = -6$
 $x = -3$

k) $4\sqrt[3]{2x-8} = 8$
 $(\sqrt[3]{2x-8})^3 = (2)^3$
 $2x-8 = 8$
 $2x = 16$
 $x = 8$

f) $2x^3 + 20 = 36$
 $2x^3 = 16$
 $x^3 = 8$
 $x = 2$

l) $2(x-2)^{2/3} = 50$
 $(x-2)^{2/3} = 25$
 $((x-2)^{2/3})^{3/2} = (25)^{3/2}$
 $x-2 = 125$
 $x = 127$

3) Continued.

$$m) 12 - (x+5)^3 = 76$$

$$-(x+5)^3 = 64$$

$$\sqrt[3]{(x+5)^3} = \sqrt[3]{-64}$$

$$x+5 = -4$$

$$x = -9$$

$$n) \log_9 3 = x$$

$$9^x = 3$$

$$3^{2x} = 3^1 \quad (x = 1/2)$$

$$o) \log_4 (5x-1) = 3$$

$$4^3 = 5x-1$$

$$64 = 5x-1$$

$$65 = 5x$$

$$x = 13$$

$$p) (x^2+9)(x-3)(x+2) = 0$$

$$x = \pm 3i, 3, -2$$

4) Imag #s

$$a) (3+2i)(4-5i)$$

$$12 - 15i + 8i - 10i^2$$

$$22 - 7i$$

$$b) (2-6i)^2$$

$$(2-6i)(2-6i)$$

$$4 - 24i - 36i^2$$

$$4 + 36 - 24i$$

$$40 - 24i$$

$$c) 3 + 2i$$

$$4 - 5i$$

$$7 - 3i$$

$$d) 11 + 8i$$

$$-9 + 5i$$

$$2 + 13i$$

$$e) (11+8i)(9-5i)$$

$$99 - 55i + 72i - 40i^2$$

$$99 + 40 + 17i$$

$$139 + 17i$$

$$f) (4-2i)(4+2i)$$

$$16 - 4i^2 = 20$$

$$5) \begin{array}{r} -1 \mid 1 \quad -4 \quad -2 \quad 3 \\ \quad \quad -1 \quad 5 \quad -3 \\ \hline 1 \quad -5 \quad 3 \quad 0 \end{array}$$

$$B) \begin{array}{r} 2 \mid 3 \quad 6 \quad 2 \quad -12 \quad 9 \\ \quad \quad 6 \quad 12 \quad 28 \quad 32 \\ \hline 3 \quad 6 \quad 14 \quad 16 \quad 41 \end{array}$$

(A)

$= x^2 - 5x + 3$
(x+1) is a factor!

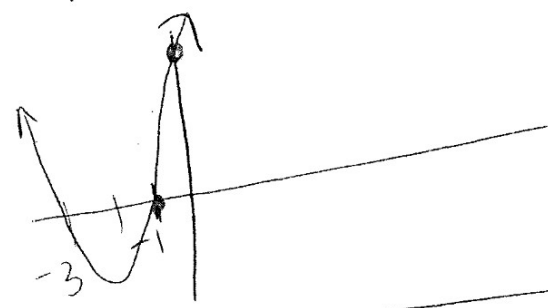
$3x^3 + 6x^2 + 14x + 16 + \frac{41}{x-2}$
(x-2) not a factor

(A) $f(x) = x^4 + 4x^3 + 7x^2 + 16x + 12$

$$\begin{array}{r} -1 \mid 1 \quad 4 \quad 7 \quad 16 \quad 12 \\ \quad \quad -1 \quad -3 \quad -4 \quad -12 \\ \hline 1 \quad 3 \quad 4 \quad 12 \quad 0 \end{array}$$

$= (x+1)(x^3 + 3x^2 + 4x + 12)$
 $= (x+1)(x^2(x+3) + 4(x+3))$
 $f(x) = (x+1)(x+3)(x^2+4)$

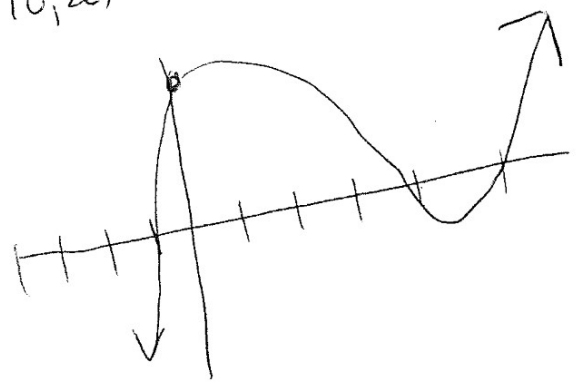
Xint: (-1,0) (-3,0)
 endbehav: ↗ ↗
 Yint: (0,12)



B) $f(x) = x^3 - 8x^2 + 11x + 20$

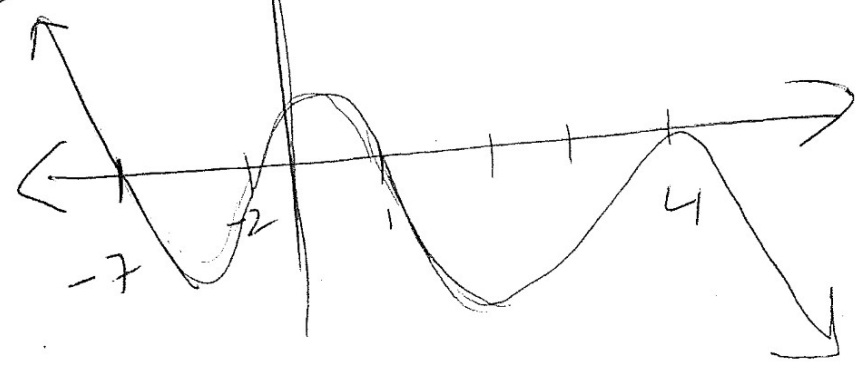
$$\begin{array}{r} -1 \mid 1 \quad -8 \quad 11 \quad 20 \\ \quad \quad -1 \quad 9 \quad -20 \\ \hline 1 \quad -9 \quad 20 \quad 0 \end{array}$$

$= (x+1)(x^2 - 9x + 20)$
 $f(x) = (x+1)(x-4)(x-5)$
 Xint: (-1,0) (4,0) (5,0)
 endbehav: ↖ ↗
 Yint (0,20)



C) $f(x) = -(x-4)^2(x+2)^3(x-1)(x+7)$

Degree: 7 odd. LC neg
 endbehavior: ↖ ↗
 Xint: (4,0) ← bounce.
 (-2,0) ← cut.
 (1,0) ← cut
 (-7,0) ← cut



$$b) f(x) = -2x^3 - 6x^2 + 2x + 6$$

$$= -2(x^3 + 3x^2 - x - 3)$$

$$= -2(x^2(x+3) - 1(x+3))$$

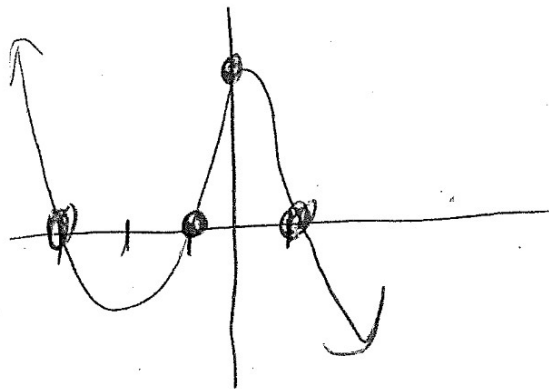
$$f(x) = -2(x^2 - 1)(x+3)$$

$$f(x) = -2(x+1)(x-1)(x+3)$$

end behav: \nwarrow

$$x_{int}: (-1, 0) (1, 0) (-3, 0)$$

$$y_{int}: (0, 6)$$



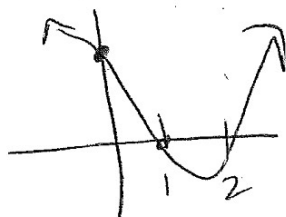
$$c) f(x) = 2x^4 - 2x^3 - 3x^2 - 7x + 10$$

$$\begin{array}{r|rrrrr} \textcircled{1} & 2 & -2 & -3 & -7 & 10 \\ & & 2 & 0 & -10 & -10 \end{array}$$

$$\begin{array}{r|rrrrr} \textcircled{2} & 2 & 0 & -3 & -10 & 0 \\ & & 4 & 8 & 10 & 0 \\ \hline & 2 & 4 & 5 & 0 & \end{array}$$

$$= (x-1)(x-2)(2x^2 + 4x + 5)$$

\uparrow can't factor



$$x_{int}: (1, 0) (2, 0)$$

$$y_{int}: (0, 10)$$

end behav: $\nearrow \uparrow$

~~f) $f(x) = x^4 + 2x^3 + 2x^2 + 4x - 8$~~

1	2	4	-8
3	5	9	

~~tested P/Q $\pm 1 \pm 2 \pm 4 \pm 8$~~

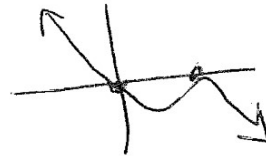
~~no rational roots!~~

~~need a cycle~~

$$g) f(x) = -x(x-2)^2$$

$$(0, 0) (2, 0) (2, 0)$$

3rd degree $\nwarrow \searrow$



f)

$$f(x) = x^4 + x^3 + 2x^2 + 4x - 8$$

$$\begin{array}{r|rrrrr} \textcircled{1} & 1 & 1 & 2 & 4 & -8 \\ & & 1 & 2 & 4 & 8 \end{array}$$

$$= (x-1)(x^3 + 2x^2 + 4x + 8)$$

$$= (x-1)(x^2(x+2) + 4(x+2))$$

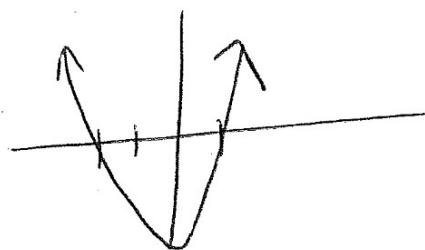
$$= (x-1)(x^2 + 4)(x+2)$$

$$x_{int}: (1, 0) (-2, 0)$$

imag roots $\pm 2i$

$$y_{int}: (0, -8)$$

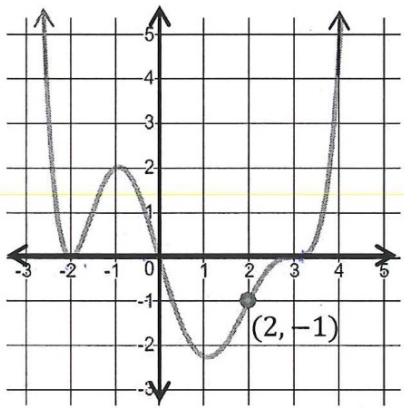
end behav $\nearrow \uparrow$





even degree LC +

9. Write the equation in factored form whose graph is shown below.



$$f(x) = (x+2)^2(x-3)$$

$$f(x) = a(x+2)^2(x-3)$$

$$-1 = a(2)(4)^2(-1)$$

$$-1 = 32a$$

$$a = -1/32$$

$$f(x) = -\frac{1}{32}x(x+2)^2(x-3)$$

E. Exponentials and Logs (NON-CALC)

1. Evaluate the expression without using a calculator.

a. $(16)^{\frac{3}{4}} = (2^4)^{\frac{3}{4}} = 2^3 = 8$

b. $(\sqrt[3]{-64})^2 = (-2)^2 = 4$

c. $(-1000)^{\frac{2}{3}} = (-10^3)^{\frac{2}{3}} = 100$

d. $(\sqrt{25})^2 = 25$

2. Rewrite the expressions in logarithmic form.

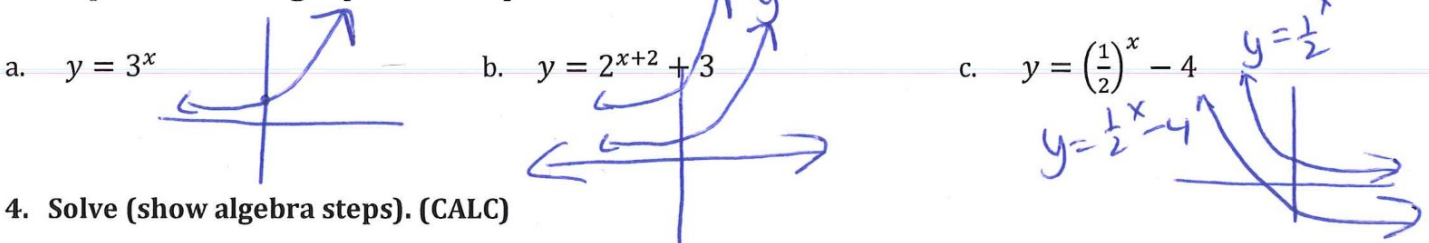
a. $9^2 = 81 \Rightarrow \log_9 81 = 2$

b. $(\frac{1}{64}) = (\frac{1}{4})^3 \Rightarrow \log_{\frac{1}{4}} (\frac{1}{64}) = 3$

c. $8^3 = 512 \Rightarrow \log_8 512 = 3$

d. $(\frac{1}{3})^{-2} = 9 \Rightarrow \log_{\frac{1}{3}} 9 = -2$

3. Graph the following exponential equations.



4. Solve (show algebra steps). (CALC)

a. You deposit \$2200 in a bank account. Find the balance after 4 years if the account pays 3% annual interest:

i. compounded quarterly: $y = 2200(1 + \frac{0.03}{4})^{16} = 2491.38$

ii. compounded continuously: $y = 2200e^{0.03(4)} = 2480.49$

b. A new car that cost \$22,000 decreased in value to \$6000 in 5 years. Find the average annual rate of depreciation.

$$6000 = 22000(1-r)^5 \Rightarrow 22.88\%$$

c. You have \$2000 to invest in a savings account that earns 3.25% interest compounded quarterly.

- How much money will you have in 5 years?
- How many years does it take the account to grow to \$8,000? Solve algebraically and round your answer to the nearest tenth.

(i) $y = 2000(1 + \frac{0.0325}{4})^{20} = 2351.35$

(ii) $8000 = 2000(1 + \frac{0.0325}{4})^{4x}$

$$4 = (1 + \frac{0.0325}{4})^{4x}$$

$$1.068125^{4x} = 4$$

$$4x = \frac{\ln 4}{\ln 1.068125} \Rightarrow x = 42.8$$

F. Inverses (NON-CALC)

1. Find the inverses

a. $y = \sqrt[3]{2x-7}$
 $x = \sqrt[3]{2y-7}$
 $x^3 = 2y-7$ $f^{-1}(y) = \frac{x^3+7}{2}$

b. $y = (x-3)^2$
 $\sqrt{x \pm (y-3)^2}$
 $\sqrt{x} = y-3$
 $f^{-1}(x) = \sqrt{x} + 3$

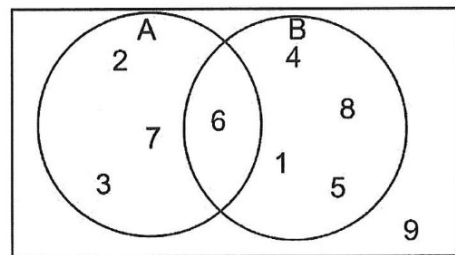
c. $y = \sqrt{x+3}$
 $x = \sqrt{y+3}$
 $x^2 = y+3$
 $f^{-1}(y) = x^2 - 3$

G. Probability (Some CALC/Some NON-CALC)

Review of symbols:

$\cup =$ OR $\cap =$ And. $\emptyset =$ null set. A^c or $\bar{A} =$ Comp of A.

1. Given the Venn diagram below, answer the following:



- a. $B^c = 2, 3, 7, 9$
- b. $A \cap B = 6$
- c. $A^c \cap B = 4, 5, 8$
- d. $A \cup B = 1, 2, 3, 4, 5, 6, 7, 8$
- e. $A^c \cup B^c$

$1, 4, 5, 8, 9 + 2, 3, 7, 9 = 1, 2, 3, 4, 5, 8, 9$ everything except 6

2. A company is performing a market test on two different cereals, A and B, for its new product line. Out of 150 people who try the cereals, 60 like cereal A, 95 like cereal B, and 25 like both cereals.

- a) What is the probability that a person likes cereal A or cereal B? $60 + 95 - 25 = \frac{130}{150}$
- b) What is the probability that a person does not like either cereal? $\frac{20}{150}$
- c) What does $P(A^c)$ mean in words in context of the problem and what is the value of $P(A^c)$?
 Doesn't like cereal A. $\frac{90}{150}$

3. A jar contains 15 red candies, 12 blue candies, and 16 yellow candies.

- a) What is the probability of selecting a yellow candy? $\frac{16}{43}$
- b) What is the probability of selecting 2 blue candies in a row if you must put the candy back before taking the next piece?
 $(\frac{12}{43})(\frac{12}{43}) = 37\%$
- c) What is the probability of selecting 3 red candies in a row if you can eat the 1st and 2nd candies before taking the 3rd piece?
 $(\frac{15}{43})(\frac{14}{42})(\frac{13}{41}) = 3.7\%$

4. Is rolling a dice and getting a 4, then rolling again and getting a 6 an example of independent or dependent events? Explain.

one doesn't infl. the other.

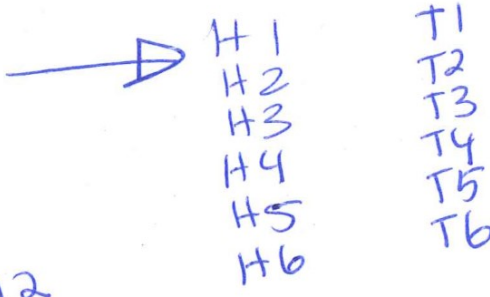
5. A group of students were surveyed on their preference for pirate or ninja movies. The data is summarized below. P = prefers pirates, N = prefers ninjas, F = female, M = male.

- a) Fill in the missing values in the table. ✓
- b) How many students were surveyed? 100
- c) Find the probability that their preference is a pirate movie, given that the student is a male. $18/45$
- d) What is the probability that the student is a female and prefers ninja movies? $33/100$
- e) What is the probability that a random student prefers ninja movies? 60%
- f) What is the probability the student prefers ninjas given they are a female? $33/55$

	Pirates	Ninjas	Totals
Male	18	27	45
Female	22	33	55
Totals	40	60	100

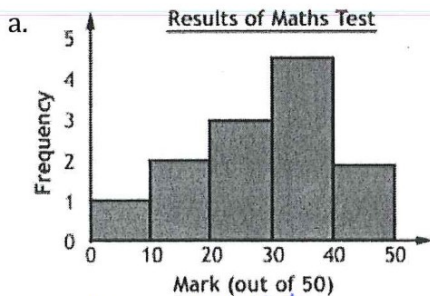
6. You flip a coin one time and a 6 sided dice.

- a) What is the sample space? 12
- b) P(head and the number 4) $1/12$
- c) P(head or the number 4) $7/12$
- d) P(rolling an even number) $6/12$
- e) P(head or rolling an odd number) $9/12$
- f) P(head and rolling an even number) $3/12$

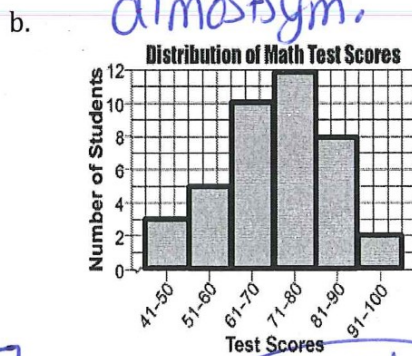


H. Statistics (CALC)

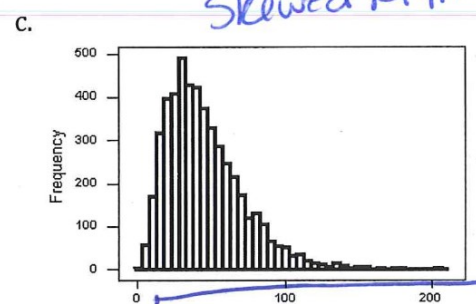
1. State whether the histograms are skewed left, skewed right or symmetric. Then estimate the median.



Skewed left
 $\text{mean} < \text{median}$

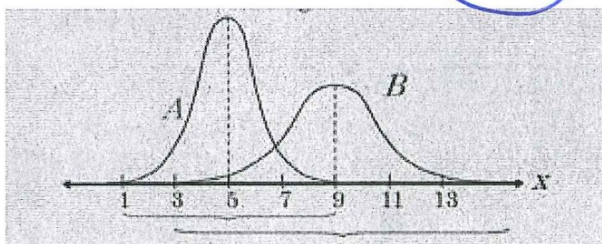


almost sym.
 $\text{mean} = \text{median}$



Skewed Right.
 $\text{mean} > \text{median}$

2. Which normal curve has the greater mean? Which curve has the greater standard deviation? B

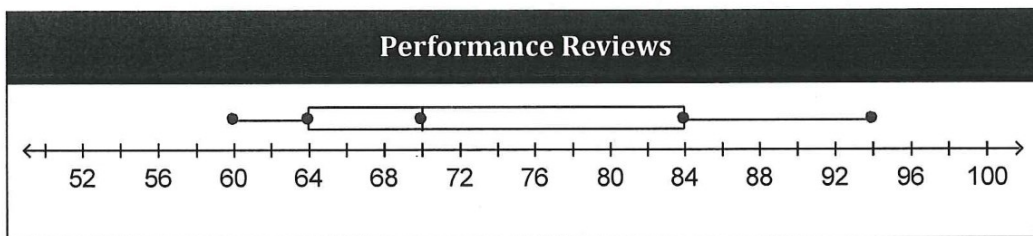


3. Sara was interested in knowing if there was a positive association between drinking coffee and participating in class for Fairfield Warde Students. She randomly selected 15 students from her class and surveyed them to ask if they drank coffee. She tallied her results and found that 80% of students drank coffee and participated in class. What conclusion can be made? (Multiple Choice)

- a. There is a positive correlation between drinking coffee and participating for Fairfield Warde students.
- b. There is a positive correlation between drinking coffee and participating in all high school students.
- c. Drinking coffee causes participation in Fairfield Warde students.
- d. Drinking coffee causes participation in all high school students.

4. If the sample size increases for your study is your margin of error smaller or larger?

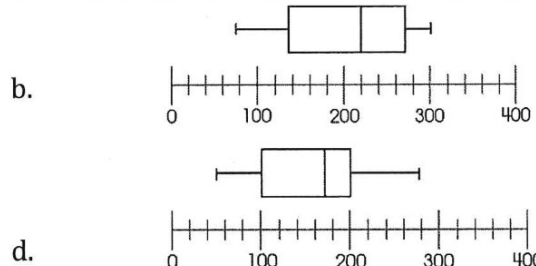
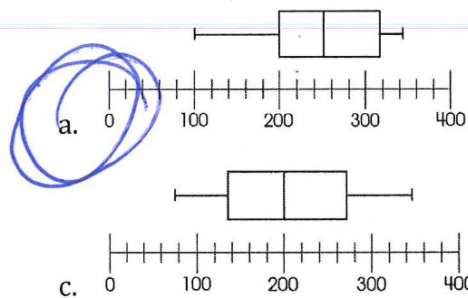
5. The performance reviews for several employees at a company are shown in the box-and-whisker plot below. What is the range of the performance review scores?



94
- 60

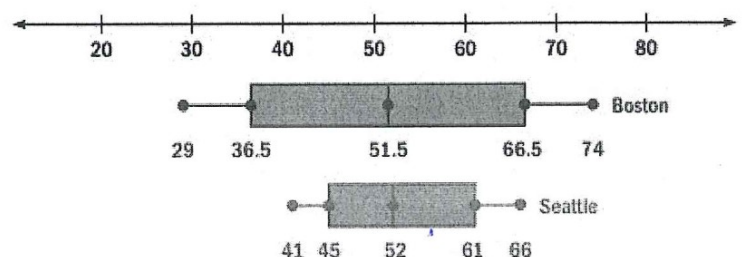
34

6. Which box-and-whisker plot represents a situation where 25% of the data is 200 or less?



7. The two box-and-whisker plots below show the average monthly temperatures for Boston and Seattle. What do the interquartile ranges tell you about the two cities? (Multiple Choice)

- a. Boston has more consistent temperatures.
- b. Seattle has more consistent temperatures.
- c. Overall Seattle is warmer than Boston.
- d. Overall Boston has a colder than Seattle.

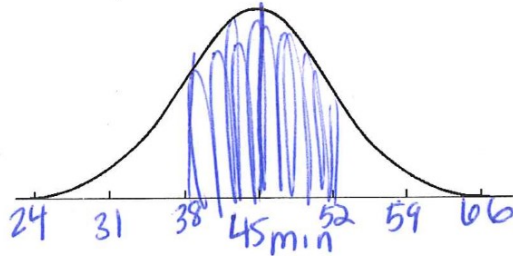


8. In a recent survey of 1500 randomly selected U.S. adults, 68% of the respondents agreed with the statement, "I should exercise more than I do." For this study, state one source of potential bias and how it would affect the estimate of the proportion of adults who would agree with the statement, "I should exercise more than I do." The number 68% represents (Multiple Choice)

- a) margin of error b) parameter c) reliability d) statistic

9. A researcher gathers data on how long teenagers spend on individual cell phone calls (in number of minutes). Suppose the research determines that these calls have a mean 45 min. and standard deviation 7 min. The researcher also claims that the distribution of the call lengths follows a normal distribution.

Label your horizontal axis with the mean and the values 1, 2 and 3 standard deviations above and below the mean. Shade the area that represents one standard deviations within the mean.

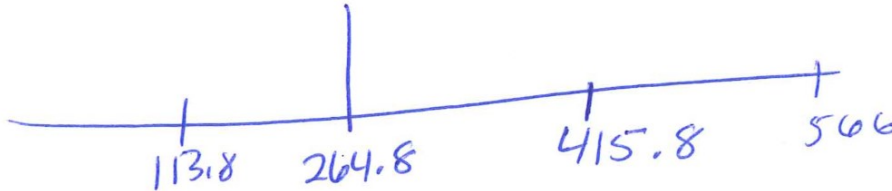


10. Use the data for average daily water usage of a family during the past 12 months. Find the mean and the standard deviation of the data. Within how many standard deviations from the mean do all the values fall? 2

- 126 118 134 545 150 480 442 310 124 149 233 367

mean = 2
 $6 = 151$

2



11. Susan keeps track of the number of tickets sold for each play presented at the Community Theater.

Number of Tickets Sold	135	71	69	80	158	152	161	96	122	118	87	85
------------------------	-----	----	----	----	-----	-----	-----	----	-----	-----	----	----

a. Find the mean, median and mode of the data set.

111.17 107 none

b. If all the values are increased by 20, what happens to the mean median and mode?

they all mean incr by 20 med incr by 20 still no mode.

12. A town planning board wants to estimate the average value of houses in Fairfield. The board randomly selects 500 houses from different areas of the town and uses town records to calculate the median house value to be \$502,200.

a) Is this an experiment, survey or observational study? Explain your choice.

X

coll data.

b) What is the sample and what is the population?

sample: 500 random sel. houses in fairfield
 pop: all the houses in fairfield.

c) Is number \$502,200 a statistic or a parameter? Explain.

ble based on 500 randomly selected houses

13. An education official wants to estimate the proportion of adults aged 18 or older who had read at least one book during the previous year. A random sample of 1006 adults aged 18 or older is obtained, and 835 of those adults had read at least one book during the previous year.

Population: All adults age 18 or older
 Sample: Random sample of 1006 adults aged 18 or older.
 Parameter: % of all adults who read at least 1 book during prev. year.
 Statistic: $\frac{835}{1006} = 83\%$

For questions #14 - 17: Explain whether each situation is an experiment, observational study, or survey.

14. The research department of a retail company plans to conduct a study to determine whether a dye used on a new T-shirt will begin fading before 50 washes.

E

15. A literacy group wants to determine whether high school students that participated in a recent national reading program had higher standardized test scores than high school students that did not participate in the program.

O.S.

16. A group of high school students is randomly selected and asked to complete the form:

Do you agree with the new lunch rules?
<input type="checkbox"/> agree
<input type="checkbox"/> disagree
<input type="checkbox"/> don't care

Survey

17. An advertising company wants to test a new logo design. They randomly select 20 participants and watch them discuss the logo.

O.S.

18. A recent survey by alumni of a major university indicated that the average salary of 11,500 of its 225,000 graduates was \$100,000. Does this value describe a population parameter or a sample statistic? Explain.

Sample statistic came from a survey not census.

19. The average salary of all General Motors workers is \$30,500. Does this value describe a population parameter or a sample statistic? Explain.

pop. parameter. from all workers.

20. In March of this year, the postmaster for Stamford, CT wanted to plan for the expected crowds filing their tax returns at the last minute. To do this, she decided to estimate the percentage of tax filers who planned to file their returns on April 15. Using a random-digit dialing technique, a group of 4000 tax filers were interviewed, revealing that 350 of them said it was likely that they would not file until the last day. Identify the following:

Population: all tax payers in Stamford, CT

Parameter: true % that fill out return on 4/15

Sample: 4000 tax payers. randomly chosen.

Statistic: $\frac{350}{4000}$ will fill out tax last day.

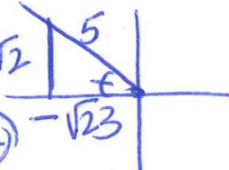
I. Trigonometry (NON-CALC)

1. Find the Quadrant in which each angle lies, find the angle's reference angle, and determine the sine, cosine and tangent for each angle. List two other angles (one positive and one negative) that are co-terminal to the given angle (terminal ray that ends in the same spot)

Degrees	Radians	Cos θ	Sin θ	Tan θ	(+)Coterminal	(-)Coterminal
90°	$\frac{\pi}{2}$	0	1	\emptyset	450° $5\pi/2$	-270° $-3\pi/2$
90°	$\pi/2$	0	1	\emptyset	same.	
135°	$\frac{3\pi}{4}$	$-\frac{\sqrt{2}}{2}$	$\frac{\sqrt{2}}{2}$	-1	495° $11\pi/4$	-225° $-5\pi/4$
-60°	$-\pi/3$	$+\frac{1}{2}$	$-\frac{\sqrt{3}}{2}$	$-\sqrt{3}$	300° $5\pi/3$	-420° $-7\pi/3$
540°	3π	-1	0	0	π	$-\pi$
150°	$\frac{5\pi}{6}$	$-\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$-\frac{\sqrt{3}}{3}$	510° $17\pi/6$	-210° $-7\pi/6$
30°	$\frac{\pi}{6}$	$+\frac{\sqrt{3}}{2}$	$+\frac{1}{2}$	$+\frac{\sqrt{3}}{3}$	390° $13\pi/6$	-330° $-11\pi/6$
150°	$5\pi/6$	$-\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$-\frac{\sqrt{3}}{3}$	same as	

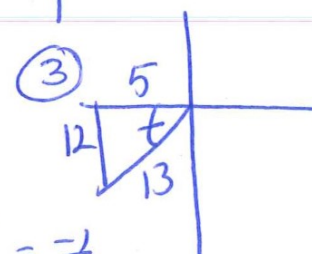
2. If $\sin \theta = \frac{\sqrt{2}}{5}$ and $90^\circ \leq \theta \leq 180^\circ$ what is $\tan \theta$ and $\cos \theta$?

$\cos \theta = -\frac{\sqrt{23}}{5}$ $\tan \theta = -\frac{\sqrt{2}}{\sqrt{23}} = \frac{-\sqrt{46}}{2}$



3. If $\cos \theta = -\frac{5}{13}$ and $180^\circ \leq \theta \leq 270^\circ$ what is $\sin \theta$ and $\tan \theta$?

$\sin \theta = -\frac{12}{13}$ $\tan \theta = +\frac{12}{5}$



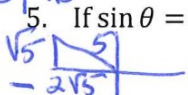
4. If $\sin \theta = \frac{8}{17}$ what are the possible values of $\cos \theta$ and $\tan \theta$?

$\cos \theta = \pm \frac{15}{17}$ $\tan \theta = \pm \frac{8}{15}$



5. If $\sin \theta = \frac{\sqrt{5}}{5}$ and $90^\circ \leq \theta \leq 180^\circ$ what are the possible values of $\cos \theta$ and $\tan \theta$?

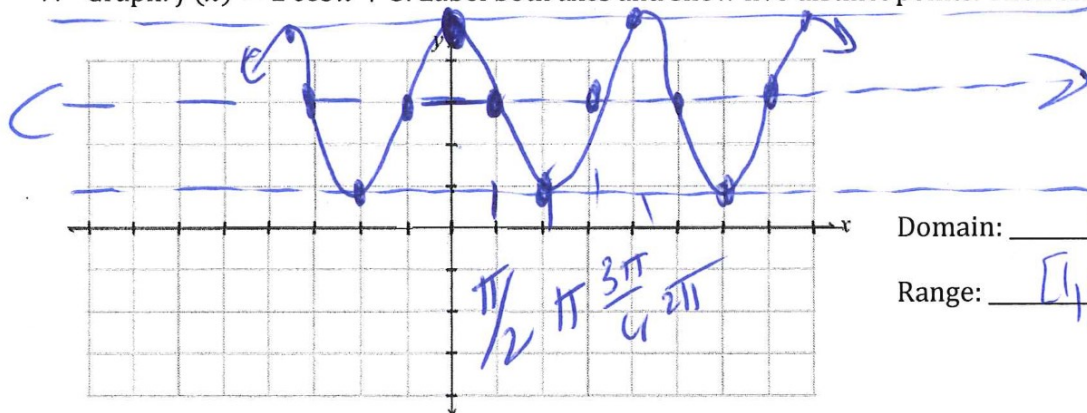
$\cos \theta = -\frac{2\sqrt{5}}{5}$ $\tan \theta = \frac{\sqrt{5}}{-2\sqrt{5}} = -\frac{1}{2}$



6. Give a co-terminal angle for $-\frac{\pi}{3}$ over the domain of $0 \leq \theta \leq 2\pi$.

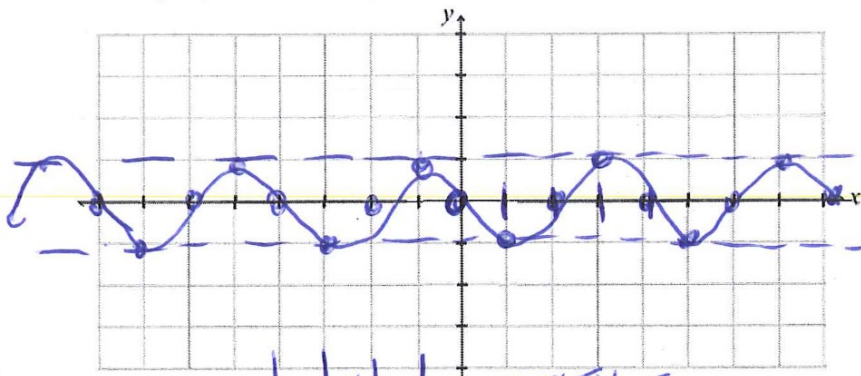
$10\pi/6$ $5\pi/3$

7. Graph: $f(x) = 2 \cos x + 3$. Label both axes and show five distinct points. Then state the domain and range.



Domain: $(-\infty, \infty)$
Range: $[1, 5]$

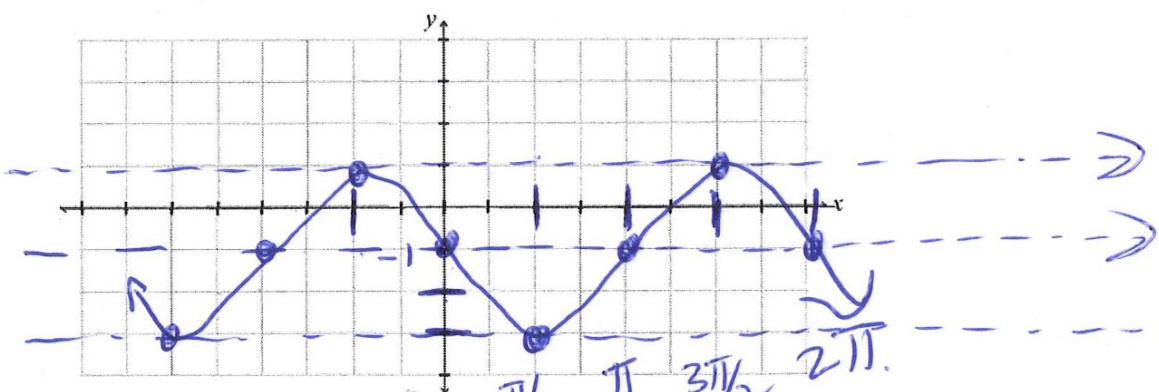
8. Graph: $f(x) = -\sin(2x)$. Label both axes and show five distinct points. Then state the domain and range.



period = π

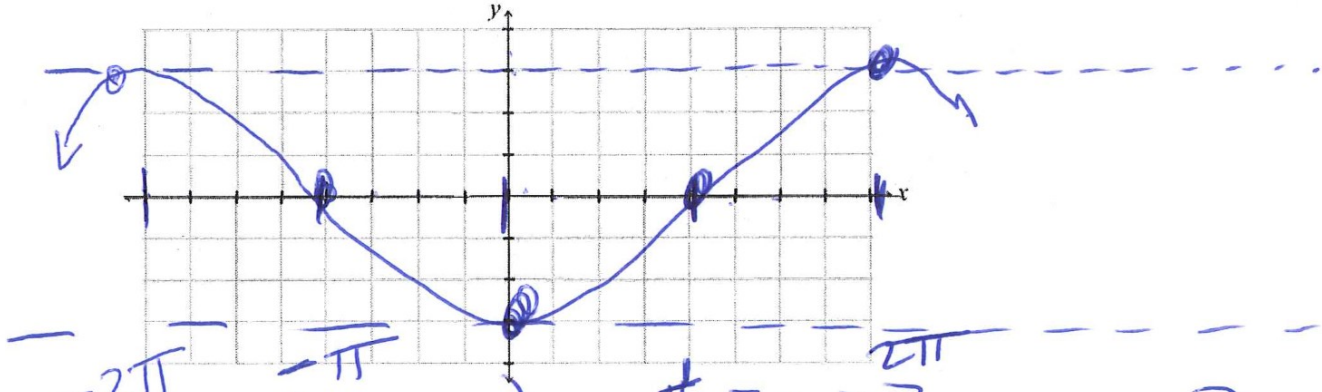
Domain: $(-\infty, \infty)$
 Range: $[-1, 1]$

9. Graph $f(x) = -2\sin x - 1$. Label y axis with appropriate scale, list points for local minimums and maximums, write the equation for the midline, list the period, and domain and range.



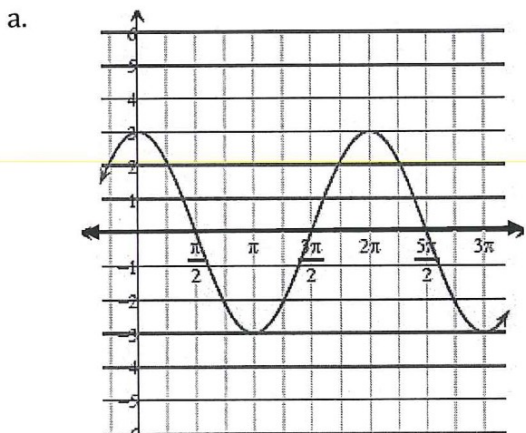
Domain: $(-\infty, \infty)$ Range: $[-3, 1]$ Amplitude: 2
 Vertical Shift (midline): X Period: 2π
 Maximum: 1 Minimum: -3

10. Graph $f(x) = -3\cos(\frac{1}{2}x)$. Label y axis with appropriate scale, list points for local minimums and maximums, write the equation for the midline, list the period, and domain and range.

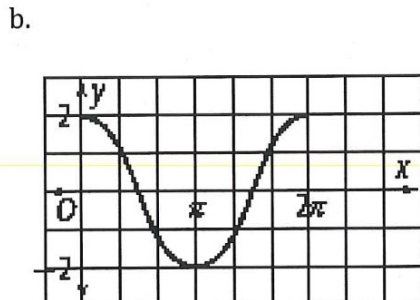


Domain: $(-\infty, \infty)$ Range: $[-3, 3]$ Amplitude: 3
 Vertical Shift (midline): X Period: 4π
 Maximum: 3 Minimum: -3

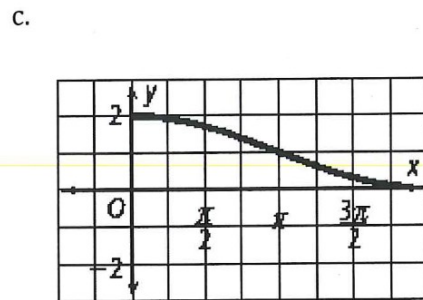
11. Write a sine or cosine equation for the periodic functions.



$$f(x) = 3 \cos(x)$$



$$f(x) = 2 \cos(x)$$



$$y = \cos\left(\frac{1}{2}x\right) + 1$$

J. Sequences and Series (CALC)

1. State if the sequence is arithmetic, geometric, or neither. Then write a rule for the sequence. Find the 5th term of each sequence.

(A) a. -2, 2, 6, ...

$$a_n = 4n - 6$$

$$a_5 = 14$$

b. $\frac{2}{60}, \frac{3}{60}, \frac{4}{60}, \dots$

$$a_n = \frac{1}{60}n + \frac{1}{60}$$

$$a_5 = 6/60$$

(a) c. 21, 14, 7, ...

$$a_n = -7n + 28$$

$$a_5 = -7$$

(B) d. 24, 18, $\frac{27}{2}, \frac{81}{8}, \dots$

$$a_n = \left(24 \cdot \frac{3}{4}\right)^{n-1}$$

$$a_5 = 243/32$$

e. 1, -3, 9, -27, ...

$$a_n = (-3)^{n-1}$$

$$a_5 = 81$$

2. Write a rule for the sequences below. Then write the sequences in summation form and then find the sum.

a. $8 + 12 + 16 + \dots + 116$

$$\sum_{n=1}^{24} 4n + 4 = 868$$

b. -1, 0.2, -0.04, ...

$$\sum_{n=1}^{\infty} -1(-.2)^{n-1}$$

3. Find the sum of the following series.

a. $\sum_{n=1}^4 n^2 - 1$

$$26$$

b. $\sum_{n=3}^{10} 2n - 5$

$$32$$

c. $\sum_{n=1}^{\infty} 2\left(\frac{1}{3}\right)^{n-1}$

$$3$$

d. $\sum_{n=1}^6 2\left(\frac{2}{3}\right)^{n-1}$

$$\frac{1330}{243}$$