ALGEBRA 32

Below are formulas provided:

$$P = \frac{2\pi}{\omega} \qquad\qquad \omega = \frac{2\pi}{p}$$

$90°, \frac{\pi}{2}, (0,1)$

$60°, \frac{\pi}{3}, (\frac{1}{2}, \frac{\sqrt{3}}{2})$

$45°, \frac{\pi}{4}, (\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2})$

$30°, \frac{\pi}{6}, (\frac{\sqrt{3}}{2}, \frac{1}{2})$

$0°, 360°, 2\pi$
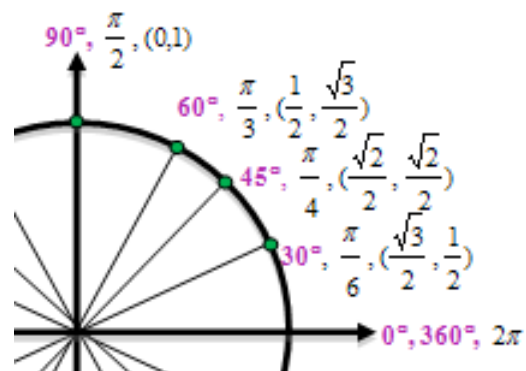
$$a_n = a_1 + (n-1)d \qquad\qquad a_n = a_1(r)^{n-1} \qquad\qquad S_n = a_1\left(\frac{1-r^n}{1-r}\right)$$

$$S_n = \frac{n}{2}(a_1 + a_n) \qquad\qquad S_n = \frac{a_1}{(1-r)}$$

Suggested YouTube Videos for Some Topics

Functions:

Transforming Piecewise functions:
https://www.youtube.com/watch?v=zJ9PD-y1lWY – Move past
beginning for examples
https://www.youtube.com/watch?v=YEvyJAzTNUk

Evaluating from graph using function notation:
https://www.youtube.com/watch?v=kzYtx_AqzjM
https://www.youtube.com/watch?v=uaPm3Tpuxbc

Polynomials:

Factoring:
https://www.youtube.com/watch?v=GMoqg_s4Dl4
https://www.youtube.com/watch?v=GMoqg_s4Dl4
https://www.youtube.com/watch?v=GMoqg_s4Dl4

Adding and Subtracting Polynomials:
https://www.youtube.com/watch?v=DMyhUb1pZT0
https://www.youtube.com/watch?v=ZgFXL6SEUiI

Multiplying Polynomials:
https://www.youtube.com/watch?v=fGThIRpWEE4
https://www.youtube.com/watch?v=gg6vUnElXqo

Dividing Polynomials (Long and Synthetic):
https://www.youtube.com/watch?v=4u8_AMacu-Y
https://www.youtube.com/watch?v=1byR9UEQJN0
https://www.youtube.com/watch?v=3Ee_huKclEQ

Writing functions from roots, zeroes, x-intercepts:
https://www.youtube.com/watch?v=anWlXiCR01Y

Operations with Complex Numbers:
https://www.youtube.com/watch?v=SfbjqVyQljk
https://www.youtube.com/watch?v=cWn6g8Qqvs4
https://www.youtube.com/watch?v=tvXRaZbIjO8

Exponentials:

Simplifying with rational (fractional) exponents:
https://www.youtube.com/watch?v=0z-yIFzpunM
https://www.youtube.com/watch?v=KGSvigZQKZY
Changing between radical and exponential form:
https://www.youtube.com/watch?v=jO4wOQQiVZg
https://www.youtube.com/watch?v=zlRKO21qEpQ

Graphing Exponentials:

https://www.youtube.com/watch?v=6WMZ7J0wwMI

Sequences and Series:

Arithmetic Sequences and Series:
https://www.youtube.com/watch?v=lj_X9JVSF8k
https://www.youtube.com/watch?v=W95f3ugDqXM

Geometric Sequences and Series:
https://www.youtube.com/watch?v=rtsk8caxbr4

Probability:

Probability with and without replacement:
https://www.youtube.com/watch?v=uKTjh-6PFjo Has an ad,
sorry
https://www.youtube.com/watch?v=ShQu-ly3aE4
https://www.youtube.com/watch?v=w34olO5Phb8
Venn diagrams:
https://www.youtube.com/watch?v=jAfNg3ylZAI
https://www.youtube.com/watch?v=jAfNg3ylZAI
Two Way Tables including Conditional Probability:
https://www.youtube.com/watch?v=ETgYbFmV0Ws

Trigonometry:

Evaluating Angles Using the Unit Circle:
https://www.youtube.com/watch?v=NO4H4YROdqk Ignore
end about inverses and functions we do not cover
https://www.youtube.com/watch?v=IQlD5GTsqOw Finds
some angles we didn't look at – only do angles w/in
one rotation of the circle

Converting Radians to Degrees and Vice Versa:
https://www.youtube.com/watch?v=9zspW8u6kQM

Finding other trigonometric functions, given one and
quadrant:
https://www.youtube.com/watch?v=L2tNxfipfoQ Only need
to find sine, cosine and tangent, ignore other three
functions

# Calculators will be allowed on questions notated with (***)

Functions:

1) Use the function: $f(x) = 2x^4 - x^3 + 3x^2 - 4x + 6$ to solve each of the following:

a) f(0) =
b) f(1) =
c) f(-1) =
d) f(2) =

e) f(-2) =
f) $f\left(\frac{1}{2}\right) =$
g) $f\left(-\frac{1}{2}\right) =$
h) f(3) =

2) Use the graph below to answer the related questions:

a) Over what interval(s) is the function increasing?
b) Over what interval(s) is the function decreasing?
c) Over what interval(s) is the function constant?
d) f(-3) = ?
e) f(x) = -3 when x = ?
f) 2f(1) = ?
g) f(4) + 3 = ?
h) What is the y-intercept?
i) List the zeroes.
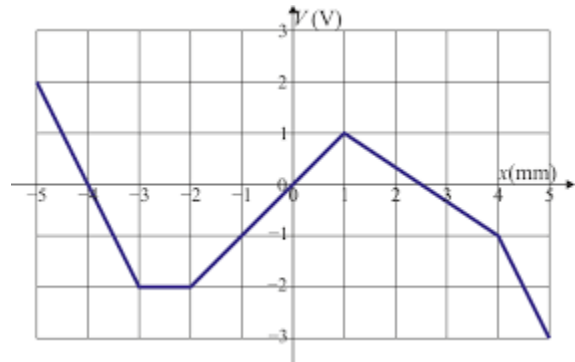
3) Use the function f(x) below to perform the transformations for each of the rewritten functions:
   DO EACH ON A SEPARATE GRAPH

a) $g(x) = f(x + 2)$
b) $h(x) = f(x) - 1$
c) $a(x) = -f(x)$
d) $b(x) = f(x + 2) - 1$
e) $c(x) = f(x - 1) + 3$
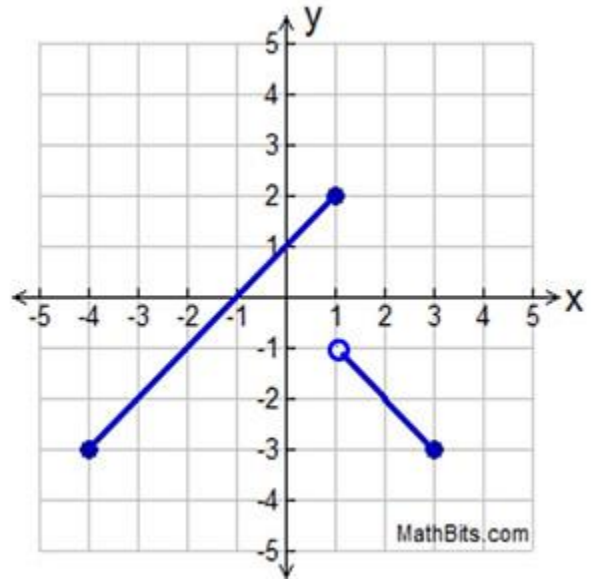
Polynomials

1) Perform the indicated operation using the functions given below:

$$f(x) = x^3 + 2x^2 - 3x + 5 \qquad\qquad g(x) = 2x^4 + 5x^2 - 10$$

a) $f(x) + g(x)$
d) $f(x) - 3g(x)$

b) $f(x) - g(x)$
e) $f(x) \times g(x)$

c) $2f(x) + g(x)$
f) $2f(x) + 3g(x)$

2) Factor each of the following:

a) $f(x) = x^3 + x^2 - 9x - 9$
d) $r(x) = x^2 - 16$

b) $g(x) = x^4 - 5x^2 + 4$
e) $j(x) = x^3 - 4x^2 - x + 4$

c) $h(x) = 2x^2 + x - 10$
f) $a(x) = 6x^3 + 12x$

3) Perform the indicated operation on the complex numbers, given that $i = \sqrt{-1}$.

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

b) $(3 - i) - (7 + 2i)$

c) $(1 - 8i)(2 + i)$

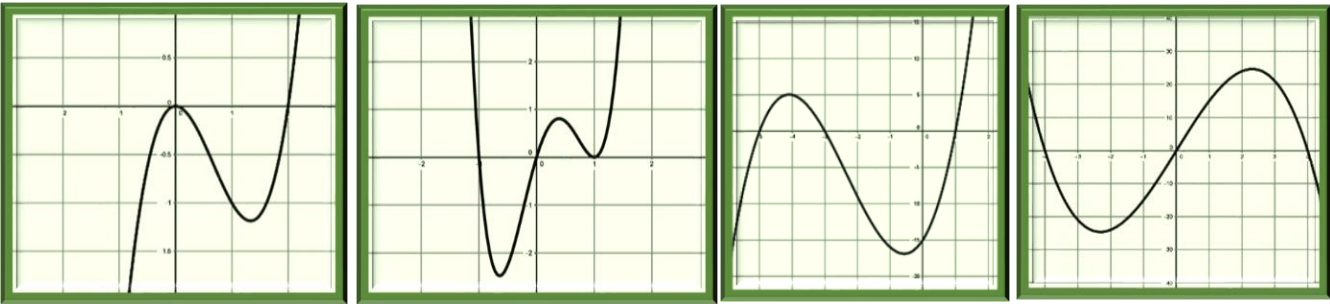4) Perform long or synthetic division on each of the following, write your result as a polynomial in standard form.

a) $(x^3 - 23x + 28) \div (x - 4)$
c) $(2x^4 + 13x^3 + 10x^2 - 18x + 35) \div (x + 5)$

b) $(x^4 - 3x^3 + 4x^2 - 5x + 10) \div (x + 3)$
d) $(x^4 - x^3 + 2x^2 - 7x + 5) \div (x - 1)$

5) Match the graph to the function.
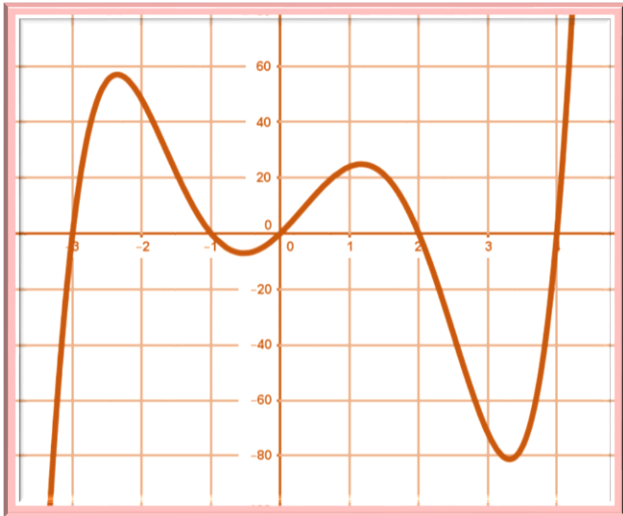

$$1.\, f(x) = (x - 1)(x + 3)(x + 5)$$

$$2.\, f(x) = x^2(x - 2)$$

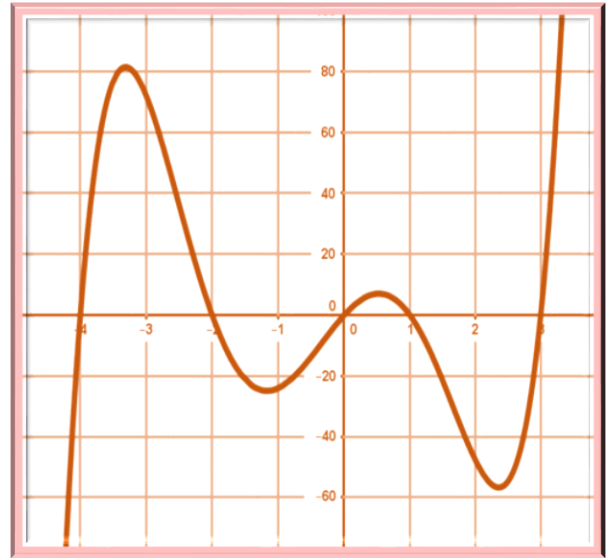$$3.\, f(x) = -x(x - 4)(x + 4)$$

$$4.\, f(x) = x(x - 1)^2(x + 1)$$

6) Write a possible function, in factored form, for the given graph, using the x-intercepts.
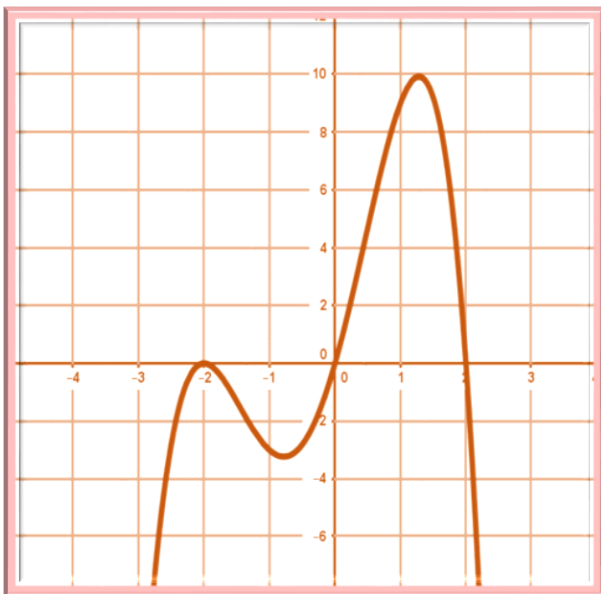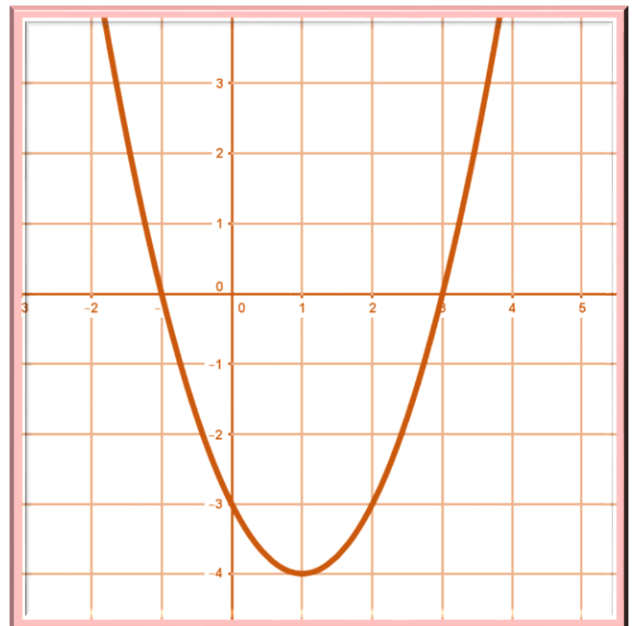
a)

b)

c)

d)

Exponential Functions

1) Simplify each of the following exponential expressions, write answer in RADICAL FORM.

a) $\left(x^{7/3}\right)\left(x^{-2/3}\right)$

b) $\left(x^{1/2}\right)\left(x^{3/4}\right)$

c) $\dfrac{\left(x^{4/3}\right)}{\left(x^{2/3}\right)}$

d) $\left(x^{5/3}y^{1/3}\right)\left(x^{-2/3}y^{4/3}\right)$

e) $\left(x^{5/4}y^{-2/3}\right)\left(x^{1/4}y^{5/3}\right)$

f) $\left(y^{1/3}\right)\left(y^{4/3}\right)$

2) Solve for x:

a) $\sqrt[3]{x-5}+2=0$

b) $\sqrt{2x+7}=5$

c) $2\sqrt{x-3}-6=4$

d) $(2x-4)^{1/2}=12$

e) $(x-5)^{2/3}=4$

f) $(x-2)^{3/2}=27$

3) Given each of the functions, answer the related questions.

a) $A=1,000(1+.07)^t$
   1) Is this growth or decay?
   2) What is the initial amount?
   3) What is the percent change?
   4) How much will there be in 5 years?

b) $A=12,000(1+\frac{.025}{12})^{12t}$
   1) Is this growth or decay?
   2) What is the initial amount?
   3) What is the percent change?
   4) How many times is the rate compounded?
   5) How much will there be in 7 years?

c) $A=925(1-.25)^t$
   1) Is this growth or decay?
   2) What is the initial amount?
   3) What is the percent change?
   4) How much will there be in 11 years?

d) $A=1,200e^{-0.0112t}$
   1) Is this growth or decay?
   2) What is the initial amount?
   3) What is the percent change?
   4) How much will there be in 5 years?

e) $A=600e^{0.81t}$
   1) Is this growth or decay?
   2) What is the initial amount?
   3) What is the percent change?
   4) How much will there be in 15 years?

f) $A=1,000e^{0.0058t}$
   1) Is this growth or decay?
   2) What is the initial amount?
   3) What is the percent change?
   4) How much will there be in 100 years?

4) Graph each of the following, create a table of values using Domain {-2, -1, 0, 1, 2}.

a) $f(x)=2^x$

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

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

d) $f(x)=3^x$

e) $f(x)=-3^x$

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

Sequences and Series

1) Match each of the following.

Add 5 to each consecutive term	Linear (negative slope)
Subtract 5 to each consecutive term	Exponential Growth
Multiply each consecutive term by 5	Linear (positive slope)
Multiply each consecutive term by $1/5$	Exponential Decay

2) ******* Write the rule (<u>equation NOT pattern</u>) for each sequence, and find a_8.

a) 2, 4, 6, 8 …

b) 2, 4, 8, 16 …

c) -5, -1, 3, 7 …

d) -24, 12, -6, 3 …

e) 18, 9, 0, -9 …

f) 1, 3, 9, 27 …

3) ******* Given the rule find the 11th term.

a) $a_n = -5n - 4$

b) $a_n = 5 + 2(n-1)$

c) $a_n = 200\left(1/2\right)^{n-1}$

d) $a_n = 4(2)^{n-1}$

e) $a_n = 2n^2 - 12$

f) $a_n = 2(-2)^{n-1}$

4) ******* Find the sum:

$$\sum_{n=1}^{5} 2n - 5$$

$$\sum_{n=1}^{8} 2(2)^{n-1}$$

$$\sum_{i=1}^{11} 3 - 4i$$

$$\sum_{i=1}^{6} 27\left(1/3\right)^{i-1}$$

$$\sum_{j=1}^{5} 3j + 8$$

$$\sum_{j=1}^{3} 7 + 4j$$

5) ******* Write each series using Sigma notation and solve.

a) 2 + 4 + 6 + … + 98
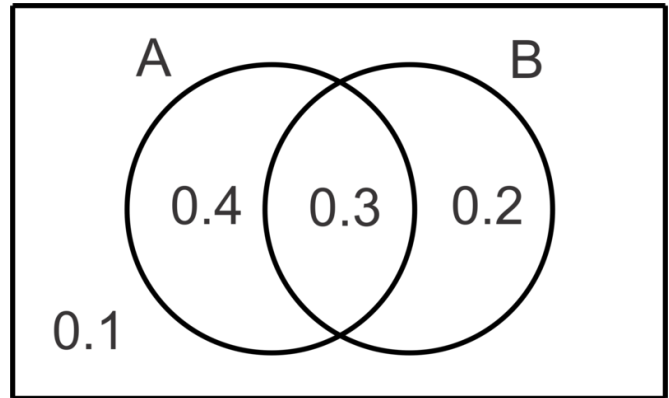
b) -24 + (-20) + (-16) + … + 32

c) 1 + 2 + 4 + … + 32

Probability

1) *** Use the given Venn diagram of the probability of an accident on I-95 [P(A)] is 70 % and the probability of an accident on the Merritt [P(B)] is 50%, to answer the related questions?

a) Find $P(A \cup B)$:
b) Find $P(A \cap B)$:
c) Find $P(A^c)$:
d) Find $P(A \cup B)^c$:
e) Explain a – d in context of the problem

2) *** In a class of 25 students, 11 study History and 12 study Geography. There are 5 students who study both History and Geography. How many students study History or Geography? (Drawing a Venn diagram my aid you)

3) *** In a group of 100 students, it was found that 40 study Math A, 30 study Drama and 54 study neither. How many students study Math A or Drama? (Drawing a Venn diagram my aid you)

4) *** In a class it was found that 64% of the students like apples, 48% like bananas and 9% like neither. How many students like both apples and bananas? (Drawing a Venn diagram my aid you)

5) *** Use the spinners below to answer the related questions. (Put answer in: reduced fraction, percent rounded to hundredth or decimal rounded to thousandth)

a) Using the color spinner, what is the probability of the pointer landing on green?
b) Using the number spinner, what is the probability of the pointer landing on a prime number (1 is NOT prime)?
c) Using the color spinner and number spinner, what is the probability of the pointer landing on red or an even number?
d) Using the number spinner, what is the probability of the pointer NOT landing on 8?
e) Using the color spinner and number spinner, what is the probability of the pointer landing on green or 6?
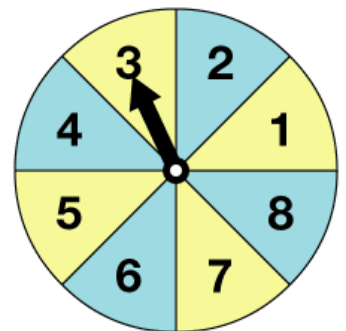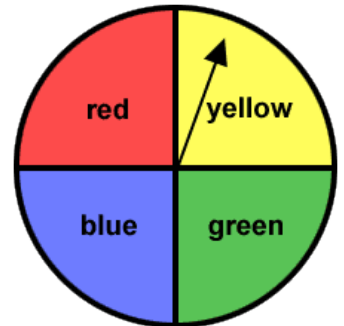
6) Write a problem that is an example of independence.
7) Write a problem that is an example of dependence.
8) *** Use the two-way frequency table to answer the related questions:

| Gender	Preferred Program			
	Dance	Sports	Movies	Total
Women	16	6	8	30
Men	2	10	8	20
Total	18	16	16	50

a) The probability the individual prefers the movies.
b) The probability the individual prefers dance and is a man.
c) The probability the individual prefers sports, given the individual is a woman
d) The probability the individual is a woman, given the individual prefers movies
e) The probability the individual is a man
f) The probability the individual is a woman who prefers dance
g) The probability The individual prefers movies, given the individual is a man
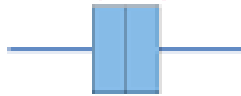
Statistics

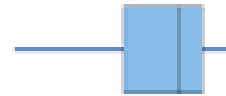1) Match each of the following histograms and box plots with its shape description (i – iv).
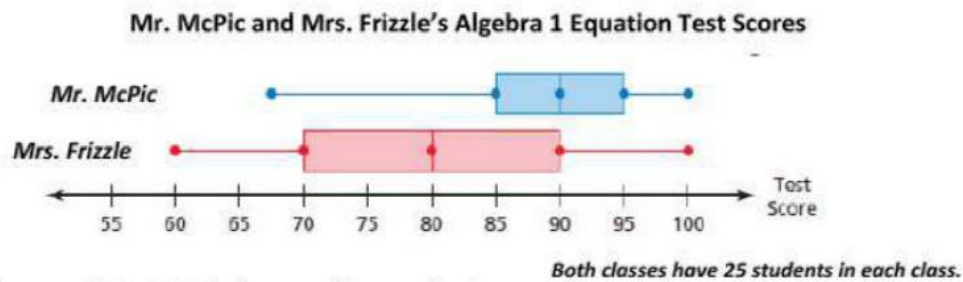

(a)
(b)
(c)
(d)
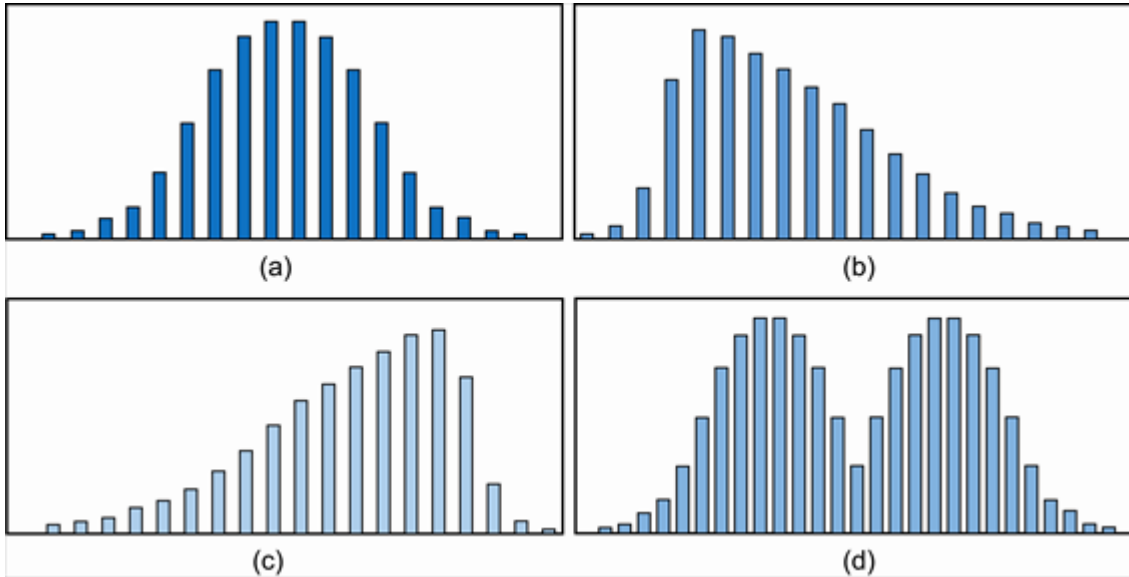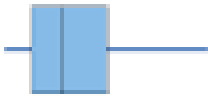
a)   b)   c)

i) symmetric   ii) right skew   iii) left skew   iv) none

2) ******* Use the double box and whisker below to answer the related questions

Mr. McPic and Mrs. Frizzle's Algebra 1 Equation Test Scores

Mr. McPic

Mrs. Frizzle

Test Score

55   60   65   70   75   80   85   90   95   100

Both classes have 25 students in each class.

a) What % of Mr. McPic's class scored between 85 and 95?
b) What is the median score in Mrs. Frizzle's class?
c) Would the mean be above or below the median in Mr. McPic's class?
d) Which class looks like it might have an outlier? Explain.
e) Can it be said Mr. McPic's class fared better than Mrs. Frizzle's? Defend your position.
f) What is Q1 in Mrs. Frizzle's class? In Mr. McPic's class?

3) The histogram below shows the ages of individuals entering a local store. The mean age of the individuals is 37.5 with a standard deviation of 7.5. Answer the related questions below.

Histogram for Age
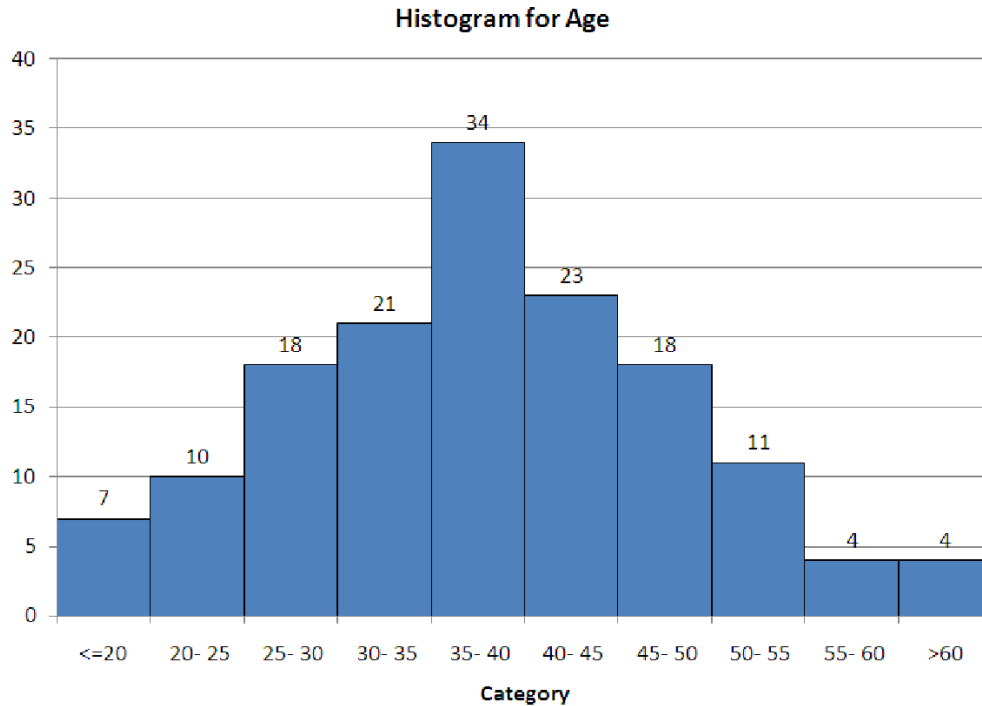
a) What is the interval of ages, one standard deviation from the mean?
b) How many people fall within one standard deviation from the mean?
c) Mark the mean and one standard deviation from the mean on the chart and shade that area of the histogram.

4) *** The mean of a set of 5 numbers is 26, with a median of 25 and standard deviation of 5, if all of the numbers were increased by 10

a) What would the mean be?
b) What would the median be?
c) What would the standard deviation be?
d) What is you changed THE ORIGINAL numbers to %s, by dividing by 100, how would this change the mean, median and standard deviation?

5) Determine the population, sample, parameter and its value , statistic and its value, margin of error and statistical range for each of the following.
a) According to the world genetics foundation 36.2% of all boys age 5 – 10 carry the blue eyed gene, a study of

308 random boys age 5 – 10 found 34% of them carried the blue eyed gene.

i. Population:
ii. Parameter
iii. Sample
iv. Statistic
v. Margin of Error
vi. Statistical Interval
vii. What happens to the margin of error when you reduce the number of your study? Increase the number in your study?

b) The Connecticut State Employee Human Resources data base shows 11.6% of employees live outside the state, a study of 1200 Connecticut State Employees found that 12% of them lived outside the state.
   i. Population:
   ii. Sample
   iii. Parameter
   iv. Statistic
   v. Margin of Error
   vi. Statistical Interval
   vii. What happens to the margin of error when you reduce the number of your study? Increase the number in your study?

6) Fairfield Woods Middle school did a survey 100 random FWMS students, to find out how many students are driven to and from school (as opposed to riding a school bus or walking). They found that 32% of students are driven to and from school.
   a) Can the school board use this information for planning the number of busses needed for the entire middle school district (FWMS, TMS, RLMS)? Explain why.
   b) Can the school board use this information for planning the number of busses needed for Fairfield Woods Middle School? Explain why.

Trigonometry

1) What is 200^0 in radians?

2) What is $\frac{\pi}{18}$ in degrees?

3) Find the exact value of each:

   a) sin 150°   b) cos 240°   c) tan 135°   d) $\sin \frac{\pi}{3}$ e) $\cos \frac{\pi}{4}$

   f) sin 240°   g) cos 225°   h) tan 120°   i) $\sin \frac{3\pi}{4}$ j) $\tan \frac{\pi}{6}$

4) Use the given value and quadrant to determine the value requested:

   a) Given $tan\theta = \frac{3}{4}$ b) Given $cos\theta = \frac{1}{2}$ c) Given $sin\theta = \frac{1}{2}$
       and $180 < \theta < 270$, find $sin\theta$ and $0 < \theta < 90$, find $sin\theta$.   and $90 < \theta < 180$, find $cos\theta$.

5) Graph 1 period of the functions below. Remember to label your scale and axes.

a) $f(x) = sin(x)$ b) $f(x) = cos(x)$ c) $f(x) = 2sin(x)$

d) $f(x) = cos(x)$ - 1   e) $f(x) = sin(x) + 2$ f) $f(x) = -cos(x)$

6) $f(x) = 3cos(2x)$
   a. What is the amplitude?
   b. What is the period?
   c. What is the horizontal shift?
   d. What is the vertical shift?
   e. Identify any other transformations on the curve.

7) $f(x) = -4si n(x) + 2$
   a. What is the amplitude?
   b. What is the period?
   c. What is the horizontal shift?
   d. What is the vertical shift?
   e. Identify any other transformations on the curve.

8) $f(x) = 2cos(x - 30) - 1$
   a. What is the amplitude?
   b. What is the period?
   c. What is the horizontal shift?
   d. What is the vertical shift?
   e. Identify any other transformations on the curve.

9) Convert 330° to radians and draw it in the correct quadrant. What is the reference angle?
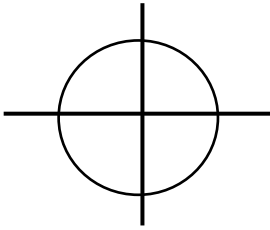

Radian measure: _____

Reference angle: _____

What quadrant is it in? _____

19) Engineers at the Big E are attempting to model the motion of the Ferris wheel. The Ferris wheel has a radius of 24 ft and the rider is 3 ft above the ground at the lowest point. When operating at full speed, the rider makes one counter-clockwise revolution every 2 minutes (120 seconds).

a. Graph one rotations. Label x and y axes with all relevant points AND what each represents.
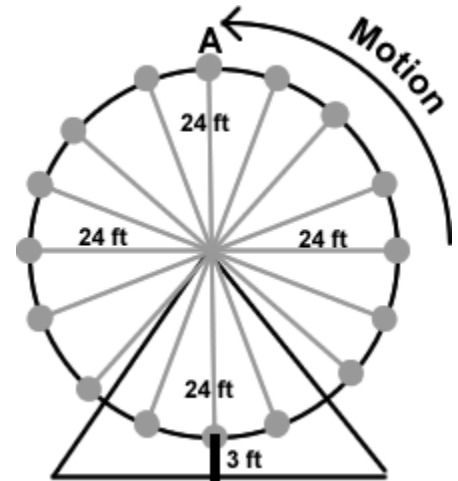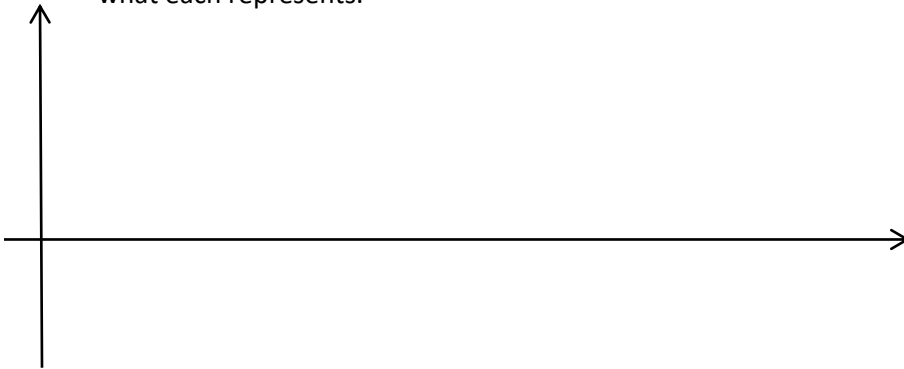
b. Use sine to write a function to model the height of the rider starting with t = 0 sec when the rider is at the bottom and reaches the top of the Ferris wheel after a ½ rotation. Find the value of A and B and explain the meaning of each parameter (A, ω, B) of the function as it relates to the Ferris wheel model.

    a. Function: $h(t) = A\sin\left(\pi x - {}^{\pi}/_{6}\right) + B$

    b. Amplitude:

    c. Midline:

    d. Period:

c. At what time(s) is the car A (assuming it started at the bottom at time zero) at 27 feet above the ground? (Only use first rotation)

d. How high is car A at 30, 60, and 90 seconds?