First Semester Topics:

NONCALCULATOR:

1. Determine if the following equations are polynomials. If they are polynomials, determine the degree, leading coefficient and constant term.

a. $f(x) = 3x$ b. $g(x) = 4x^5 - 3x^2 + 2$ c. $h(x) = \sqrt{5x^3 - 2x^2 + 12}$ no

Yes LC:3 Yes LC 4

degree 1 degree 5

2. Determine whether the x value is a solution to the equation $0 = x^4 + 6x^3 + 9x^2 + 24x + 20$

a. $x = 2$ b. $x = -1$ yes. c. $x = 0$ no

2 | 1 6 9 24 20
2 16 50
1 8 25

no

-1 | 1 6 9 24 20
-1 -5 -4 -20
1 5 4 20 0

3. Determine all real solutions of $2x^3 - x^2 - 7x + 6 = 0$. NONCALCULATOR! Show Factored Form.

1 | 2 -1 -7 6
2 1 -6
2 1 -6 0

$0 = (x-1)(2x^2 + x - 6)$

$0 = (x-1)(2x - 3)(x + 2)$

$x = 1, \; x = 3/2, \; x = -2$

4. Find all the x-intercept(s) of $f(x) = x^3 + 3x^2 - 4x - 12 = 0$. NONCALCULATOR!

$0 = x^2(x+3) - 4(x+3)$

$0 = (x^2 - 4)(x+3)$

$0 = (x-2)(x+2)(x+3)$

x int: (2, 0)
(-2, 0)
(-3, 0)

5. Simplify the Rational Expressions:

a. $\frac{3p^2 - 9p - 30}{6p^2 + 6p - 12}$

$3(p^2 - 3p - 10)$

$6(p^2 + p - 2)$

$\frac{3(p-5)(p+2)}{6(p+2)(p-1)}$

$\frac{(p-5)}{2(p-1)}$ or $\frac{p-5}{2p-2}$

b. $\frac{x^2 + 8x + 15}{2x^2 - 18}$

$\frac{(x+5)(x+3)}{2(x^2 - 9)}$

$\frac{(x+5)(x+3)}{2(x-3)(x+3)}$

$\frac{x+5}{2(x-3)}$ or $\frac{x+5}{2x-6}$

c. $\frac{3x^2 - 4x - 4}{x^2 - 4}$

$\frac{(3x+2)(x-2)}{(x+2)(x-2)}$

$\frac{(3x+2)}{(x+2)}$

6. Determine the vertical asymptote(s), horizontal asymptote and domain of the functions.

a. $f(x) = \frac{x^2-4}{x^2-2x-8}$ b. $g(x) = \frac{5x+1}{x^2-3x}$ $= \frac{5x+1}{x(x-3)}$

$\frac{(x+2)(x-2)}{(x-4)(x+2)}$

$f(x) = \frac{x-2}{x-4}$

HA: $y=1$
VA: $x=-2, x=4$

$D: (-\infty,-2) \cup (-2,4) \cup (4,\infty)$

$D: (-\infty,0) \cup (0,3) \cup (3,\infty)$
HA: $y=0$
VA: $x=0, x=3$

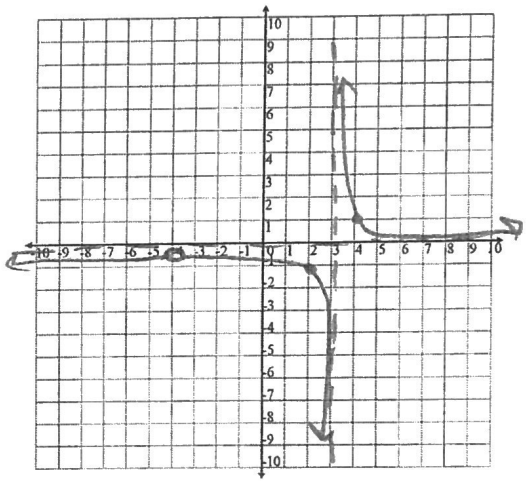
7. Identify the asymptotes/holes and any other critical points on the function below. Then graph on the axis provided.

$h(x) = \frac{x+4}{x^2+x-12}$

$\frac{x+4}{(x+4)(x-3)} = \frac{1}{x-3}$

HA $y=0$
VA $x=3$
hole $(-4, \frac{1}{-7})$

x	y
4	1
2	$\frac{1}{-1}$ -1



8. Create a rational function with the following characteristics:

Vertical asymptote x = 3 and x= 2
Horizontal asymptote y =3
X-intercepts (0,0) and $(-\frac{1}{3}, 0)$

$\frac{(x-0)(3x+1)}{(x-3)(x-2)} = f(x) = \frac{3x^2+x}{x^2-5x+6}$

9. Evaluate (non-calculator):

a. $\log_3 81$ b. $\log_2 \frac{1}{16}$ c. $\ln e^{-4}$

4 -4 -4

10. Solve the equation (non-calculator):

a. $32^{x+1} = 8^{5x}$ b. $16^{2x+1} = 64^{3x+2}$ c. $\log_2 4 + \log_2(x-1) = \log_2(x+1)$

$(2^5)^{x+1} = (2^3)^{5x}$ $(4^2)^{2x+1} = (4^3)^{3x+2}$ $\log_2 4x-4 = \log_2 x+1$

$2^{5x+5} = 2^{15x}$ $4x+2 = 9x+6$ $4x-4 = x+1$

$5x+5 = 15x$ $-4 = 5x$ $3x = 5$

$5 = 10x$ $x = \frac{1}{2}$ $-4/5 = x$ $x = 5/3$

d. $\ln(3x+1)+2\ln(3)=\ln(x^2+19x)$

$\ln(3x+1)\cdot 9=\ln(x^2+19x)$

$27x+9=x^2+19x$

$0=x^2-8x-9$

$0=(x-9)(x+1)$

$x=9$, -1 extraneous

e. $\log_2 16=x+3$

$4=x+3$

$1=x$

f. $\log_3 27=2x+1$

$3=2x+1$

$2=2x$

$x=1$

g. $\log_4(3x+4)=3$

$4^3=3x+4$

h. $5^x=125$

$5^x=5^3$

$x=3$

i. $3^{x+1}=81$

$3^{x+1}=3^4$

$x+1=4$

$x=3$

11. Simplify the expression into a+bi form:

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

$15-10i+3i-2i^2$

$15-7i+2$

$17-7i$

b. $\frac{6+2i}{3-2i}\cdot\frac{3+2i}{3+2i}$

$\frac{18+12i+6i+4i^2}{9+6i-6i-4i^2}$

$\frac{14+18i}{13}$

$\frac{14}{13}+\frac{18}{13}i$

c. $\frac{1-5i}{4+i}\cdot\frac{4-i}{4-i}$

$\frac{4-i-20i+5i^2}{16-4i+4i-i^2}$

$\frac{-1-21i}{17}$

$\frac{-1}{17}-\frac{21}{17}i$

d. $(2+3i)-(4-2i)$

$-2+5i$

12. Given $f(x)=x^2-2x+3$ *and* $g(x)=x+6$. Determine:

- f(3) → $3^2-2(3)+3$ $9-6+3$ (6)
- (f∘g)(2) $f(g(2))$ ⇒ $g(2)=8$ ⇒ $8^2-2(8)+3$ ⇒ $64-16+3$ ⇒ 51
- (g∘f)(3) $g(f(3))$ ⇒ $f(3)=9-6+3=6$ ⇒ $g(6)=6+6=12$
- (f+g)(4) $f(4)+g(4)=4^2-2(4)+3+4+6$
- (f-g)(-5) $16-8+3+10$, $8+3+10$, $11+10$, 21

$f(-5)-g(-5)$

$28-1=27$

13. Find the inverse function given $f(x)=\frac{x+1}{2x}$

$x=\frac{y+1}{2y}$

$2xy=y+1$

$2xy-y=1$

$y(2x-1)=1$

$y=\frac{1}{2x-1}$

14. Verify by composition that f and g are inverses.

$f(x)=\sqrt{x-1}$ *and* $g(x)=x^2+1$

$f(g(x))$

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

$\sqrt{x^2}$

x

$g(f(x))$

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

$x-1+1$

x ✓

b. $f(x)=2x+1$ *and* $g(x)=\frac{x-1}{2}$

$f(g(x))$

$2\left(\frac{x-1}{2}\right)+1$

$x-1+1$

x ✓

$g(f(x))$

$\frac{2x+1-1}{2}$

$\frac{2x}{2}=x$

CALCULATOR: P r=.0375 n=12 t=

15. Paula invests $250 at 3.75% compounded monthly. Determine the amount in her account after 15 years. $A = P(1+\frac{r}{n})^{nt}$ $A = 250(1+\frac{.0375}{12})^{12 \cdot 15}$ **A = $438.38**

P r=.0375

16. Frederico invests $100 at 3.75% compounded continuously. How long will it take for him to double his investment? A=200

$A = Pe^{rt}$ $200 = 100e^{.0375t}$ $2 = e^{.0375t}$ $.0375t = \ln 2$ $t \approx 18.48$ yrs $\frac{}{.0375}$

17. What principal invested at 4.65% continuously for 10 years will yield $12,000? Round to 2 decimal places. P=? r=.0465 t A

$A = Pe^{rt}$ $12{,}000 = Pe^{(.0465)(10)}$ $P = \frac{12000}{e^{.465}} \approx$ **$7,537.62**

18. The decay of a 50 mg sample of radium is given by the equation $R(t) = 50e^{-0.000433t}$, where t is time in years and R(t) is the amount of radium at a given point in time.

a. How long will it take for the sample to decay to 10 mg? $10 = 50e^{-0.000433t}$ $.2 = e^{-0.000433t}$ $-0.000433t = \ln .2$ **$t \approx 3716.9$ years**

b. What is the half life of radium? $.5 = e^{-0.000433t}$ $\ln(.5) = -0.000433t$ $t = \frac{\ln(.5)}{-0.000433}$ **$t \approx 1600.8$ yrs**

19. The number of articles making up an on-line open-content encyclopedia increased exponentially during the first few years. The number of articles, A(t), t years after 2001, can be modeled by $A(t) = 16{,}198(2.13)^t$. $1+r = 2.13$ $r = 1.13$ or 113%

a. According to this model, how many articles made up the encyclopedia in 2001? **16,198**

b. At what rate is the number of articles increasing? $r = 1.13$ = **113%**

c. During which year did the encyclopedia reach one million articles? $1{,}000{,}000 = 16198(2.13)^t$ $61.7360 = 2.13^t$ $\ln(61.7360) = t\ln 2.13$ $t = \frac{\ln(61.7360)}{\ln(2.13)}$ $t = 5.45$ yrs $2001 + 5.45$ **2006**

d. Predict the number of articles there will be at the beginning of 2018. $2018 - 2001 = 17$ years $A(17) = 16198(2.13)^{17}$ $= 6{,}193{,}193{,}554$ $\approx$ **6,193,190,000** (to the nearest ten-thousand in this case makes a reasonable prediction)

Second Semester Topics:

NONCALCULATOR:

20. Write each degree measure in radians as a multiple of π and each radian measure in degrees.

a. $136° \cdot \frac{\pi}{180} = \frac{34}{45}\pi$ b. $-45° \cdot \frac{\pi}{180} = \frac{-\pi}{4}$ c. $\frac{3\pi}{4} \cdot \frac{180}{\pi} = 135°$ d. $-\frac{5\pi}{6} \cdot \frac{180}{\pi} = -150°$

21. Find the exact value of each trigonometric function, if defined. If not defined, write undefined.

a. $\tan(-45°)$ b. $\cos\left(\frac{3\pi}{2}\right) = 0$ c. $\csc\left(\frac{5\pi}{6}\right)$ d. $\sin(900°)$ e. $\sec\left(\frac{\pi}{2}\right)$

$\frac{-\frac{\sqrt{2}}{2}}{\frac{\sqrt{2}}{2}} = -1$

$\frac{1}{\sin\frac{5\pi}{6}} = \frac{1}{\frac{1}{2}} = 2$

$= \sin 180 = 0$

$= \frac{1}{\cos\frac{\pi}{2}} = \frac{1}{0}$ undefined

22. Determine all solutions to the equation on $[0,2\pi)$

a. $4\tan(x) - 7 = 3\tan(x) - 6$

$\tan x = 1$ $x = \frac{\pi}{4}, \frac{5\pi}{4}$

b. $9 + \sin^2(x) = 10$

$\sin^2 x = 1$ $\sin x = \pm 1$ $x = \frac{\pi}{2}, \frac{3\pi}{2}$

c. $7\cos(x) = 5\cos(x) + \sqrt{3}$

$2\cos(x) = \sqrt{3}$

$\cos x = \frac{\sqrt{3}}{2}$ $x = \frac{\pi}{6}, \frac{11\pi}{6}$

d. $5\sin(x) + 2 = \sin(x)$

$4\sin x = -2$

$\sin x = -\frac{1}{2}$ $x = \frac{7\pi}{6}, \frac{11\pi}{6}$

23. Find the exact value of each of the following WITHOUT using a calculator!

a. $\tan^{-1}\left(\frac{\sqrt{3}}{3}\right) =$ Q1 $30°$ or $\frac{\pi}{6}$

b. $\sin^{-1}\left(\frac{\sqrt{3}}{2}\right) =$ Q1 $60°$ or $\frac{\pi}{3}$

c. $\arccos\left(-\frac{\sqrt{2}}{2}\right) =$ Q2 $135°$ or $\frac{3\pi}{4}$

d. $\tan^{-1}\left(\tan\left(\frac{2\pi}{3}\right)\right) =$

$\tan^{-1}\left(\frac{\frac{\sqrt{3}}{2}}{-\frac{1}{2}}\right) = \tan^{-1}(-\sqrt{3})$ Q4

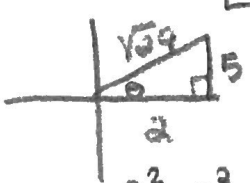
$-60°, 300°, -\frac{\pi}{3}$ or $\frac{5\pi}{3}$

e. $\sin^{-1}(\sin(-\pi)) =$

$\sin^{-1}(0)$ Q1 $0°$

f. $\cos\left(\arctan\left(\frac{5}{2}\right)\right) =$ Q1

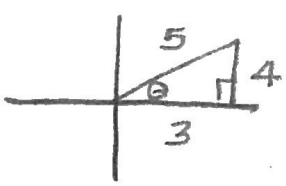
$= \frac{2}{\sqrt{29}} = \frac{2\sqrt{29}}{29}$



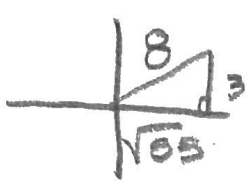
$c^2 = 2^2 + 5^2$

$c = \sqrt{29}$

g. $\sin\left(\cos^{-1}\left(\frac{3}{5}\right)\right) =$ Q1 $-\frac{4}{5}$



h. $\cos\left(\sin^{-1}\left(\frac{3}{8}\right)\right) = \frac{\sqrt{55}}{8}$ Q1



$8^2 = 3^2 + x^2$

$x = \sqrt{55}$

Find the exact value of each trigonometric function.

a. $\cos 15°$

$= \cos(45-30)$

$= \cos 45 \cos 30 + \sin 45 \sin 30$

$= \left(\frac{\sqrt{2}}{2}\right)\left(\frac{\sqrt{3}}{2}\right) + \left(\frac{\sqrt{2}}{2}\right)\left(\frac{1}{2}\right)$

$= \frac{\sqrt{6}}{4} + \frac{\sqrt{2}}{4} = \boxed{\frac{\sqrt{6}+\sqrt{2}}{4}}$

b. $\sin\frac{19\pi}{12} = \sin\left(\frac{3\pi}{12} + \frac{16\pi}{12}\right)$

$= \sin\left(\frac{\pi}{4} + \frac{4\pi}{3}\right)$

$= \sin\frac{\pi}{4}\cos\frac{4\pi}{3} + \cos\frac{\pi}{4}\sin\frac{4\pi}{3}$

$\left(\frac{\sqrt{2}}{2}\right)\left(-\frac{1}{2}\right) + \left(\frac{\sqrt{2}}{2}\right)\left(-\frac{\sqrt{3}}{2}\right)$

$\boxed{\frac{-\sqrt{2}-\sqrt{6}}{4}}$

c. $\tan 255° = \tan(225+30)$

$= \frac{\tan 225 + \tan 30}{1 - \tan 225 \tan 30}$

$= \frac{1+\frac{\sqrt{3}}{3}}{1-(1)\left(\frac{\sqrt{3}}{3}\right)} = \boxed{\frac{3+\sqrt{3}}{3-\sqrt{3}}}$

d. $\cos 25° \cos 35° - \sin 25° \sin 35°$

$= \cos(25+35)$

$= \cos(60°)$

$= \boxed{\frac{1}{2}}$

e. $\sin 135° + \tan 60°$

$= \frac{\sqrt{2}}{2} + \sqrt{3}$

$= \boxed{\frac{\sqrt{2}+2\sqrt{3}}{2}}$

f. $\cos(-120°) - \sin(315°)$

$-\frac{1}{2} - \left(-\frac{\sqrt{2}}{2}\right)$

$\boxed{\frac{\sqrt{2}-1}{2}}$

25. Establish/Prove the identities.

Simplify.

a) i. $(\sec^2 x - 1)\cos^2 x = \sin^2 x$

$\tan^2 x \cos^2 x$

$\frac{\sin^2 x}{\cos^2 x}\cdot\cos^2 x$ ✓

b) $\sec^2 x(1-\cos^2 x)$

$\frac{1}{\cos^2 x}(\sin^2 x)$

$\boxed{\tan^2 x}$

ii. $\sin x(\csc x - \sin x) = \cos^2 x$

$\sin x\left(\frac{1}{\sin x} - \sin x\right)$

$1 - \sin^2 x$

$\cos^2 x$ ✓

26. Let $\overrightarrow{AB}$ be the vector with initial point $A(10, -4)$ and terminal point $B(-1, -3)$. Write $\overrightarrow{AB}$ as a linear combination of the vectors i and j.

$\langle -1-10, -3-(-4)\rangle$

$\overrightarrow{AB} = \langle -11, 1\rangle$ component form

$\boxed{-11i + j}$ linear combination

27. Find the component form of $\overrightarrow{AB}$ with initial point $A(-12, 7)$ and terminal point $B(8, -2)$.

$\overrightarrow{AB} = \langle 8-(-12), -2-7\rangle$

$= \boxed{\langle 20, -9\rangle}$

28. Given $\mathbf{r} = \langle 3, 9\rangle$ and $\mathbf{s} = \langle -3, 6\rangle$

a. $2\mathbf{r} - \mathbf{s}$ $\langle 6,18\rangle - \langle -3,6\rangle$ $\langle 9,12\rangle$

b. $5\mathbf{r} - 2\mathbf{s}$ $\langle 15,45\rangle - \langle -6,12\rangle$ $\langle 21,33\rangle$

c. $\mathbf{r} + 2\mathbf{s}$ $\langle 3,9\rangle + \langle -6,12\rangle$ $\langle -3,21\rangle$

29. Write the following parametric equations in rectangular form:

a. $x = t - 1,\ y = 2t^2 + 6$ $t = x+1$ $y = 2(x+1)^2 + 6$ $y = 2(x^2+2x+1)+6$ $y = 2x^2+4x+2+6$ $y = 2x^2+4x+8$

b. $x = 4\cos\theta \quad y = 2\sin\theta$ $\frac{x}{4} = \cos\theta$ $\frac{y}{2} = \sin\theta$ $\sin^2\theta + \cos^2\theta = 1$ $\left(\frac{x}{4}\right)^2 + \left(\frac{y}{2}\right)^2 = 1$ $\frac{x^2}{16} + \frac{y^2}{4} = 1$

c. $x = 3t + 9,\ y = t^2 - 7$ $\frac{x-9}{3} = t$ $y = \left(\frac{x-9}{3}\right)^2 - 7$ $y = \frac{x^2-18x+81}{9} - 7$ $y = \frac{x^2-18x+81}{9} - \frac{63}{9}$ $y = \frac{1}{9}x^2 - 2x + 2$

d. $x = t^2 + 1,\ y = 4t + 3$ $t = \pm\sqrt{x-1}$ $y = \pm 4\sqrt{x-1} + 3$

30. Find the component form of $\overrightarrow{AB}$ given

a. $|v| = 12$ and direction angle $\theta = \frac{5\pi}{3}$ $\langle 12\cos\frac{5\pi}{3}, 12\sin\frac{5\pi}{3}\rangle$ $12\left(\frac{1}{2}\right), 12\left(-\frac{\sqrt{3}}{2}\right)$ $\langle 6, -6\sqrt{3}\rangle$

b. $|v| = 5$ and direction angle $\theta = 120°$ $\langle 5\cos 120, 5\sin 120\rangle$ $\langle 5\left(-\frac{1}{2}\right), 5\left(\frac{\sqrt{3}}{2}\right)\rangle$ $\langle -2.5, 4.33\rangle$

31. Given the matrices below, what is $2A + 3B$? (No Calculator)

$A = \begin{bmatrix} 5 & 0 & 9 \\ -1 & 4 & -6 \end{bmatrix}$ $B = \begin{bmatrix} 2 & 1 & -4 \\ 0 & 3 & -9 \end{bmatrix}$

$2A = \begin{bmatrix} 10 & 0 & 18 \\ -2 & 8 & -12 \end{bmatrix}$ $3B = \begin{bmatrix} 6 & 3 & -12 \\ 0 & 9 & -27 \end{bmatrix}$

$\begin{bmatrix} 16 & 3 & 6 \\ -2 & 17 & -39 \end{bmatrix}$

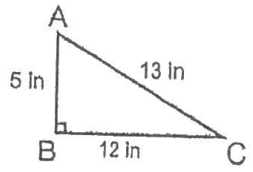
CALCULATOR:

32. In ΔABC below, find the following values.

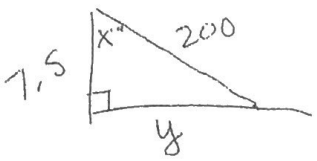
a. Angle A = 67.38° $\tan^{-1}\left(\frac{12}{5}\right)$

b. Angle C = 22.62°

c. tan A = $\frac{12}{5}$ = 2.4



33. A pilot needs to begin his descent when his plane is 7.5 km above ground and 200 km straight to the airport. At what angle should his decent be so that he can fly in a straight line from the point of initial decent to the ground? How much ground will he pass from the point of initial descent until he touches down at the airport?



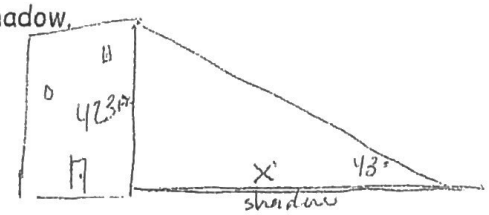
$\cos x = \frac{7.5}{200}$

2.15° angle of depression

$7.5^2 + y^2 = 200^2$

y = 199.86 km

34. If a building is 423 ft tall and the angle from its shadow to the top of the building is 43°, determine the length of the shadow.

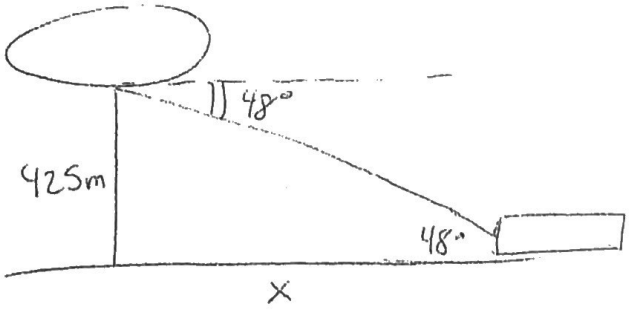


$\tan 43 = \frac{423}{x}$

$x \cdot \frac{\tan 43}{\tan 43} = \frac{423}{\tan 43}$

453.61 ft

35. A blimp was flying above Fairfield the other day at an altitude of 425 meters. Emily was in the blimp and she saw the high school. She calculated the angle of depression from the blimp to the entrance of the high school was about 48°. If she dropped a rock out of the blimp and the rock fell straight to the ground, how far away from the high school would the rock land? Round your answer to the nearest meter.



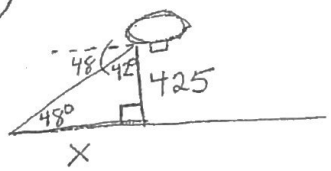
$\tan 48 = \frac{425}{x}$

$x \cdot \frac{\tan 48}{\tan 48} = \frac{425}{\tan 48}$

382.67 m

≈ 383 m

35)



$\tan 42 = \frac{x}{425}$

$382.67 = x$

36 a)

$a = 11$
$b = 6$
$c = 16.33$
$A = 22°$
$B = 11.79°$
$C = 146.21°$

"B"

$\frac{\sin 22}{11} = \frac{\sin B}{6}$

$\frac{6 \sin 22}{11} = \frac{11 \sin B}{11}$

$.204 = \sin B$

$B = 11.79$

"C"

$180 - 22 - 11.79 = 146.21°$

$\frac{\sin 22}{11} = \frac{\sin 146.21}{c}$

$c = 16.33$

36 b)

$a = 13$
$b = 12$
$c = 8$
$A = 78.28$
$B = 64.7°$
$C = 37.02°$

"B"

$12^2 = 13^2 + 8^2 - 2(13)(8)\cos B$

$-161 \quad -169 \quad -64$

$\frac{-89}{-208} = \frac{-208 \cos B}{-208}$

$64.7° = \cos B$

"A"

$13^2 = 12^2 + 8^2 - 2(12)(8)\cos A$

$169 = 144 + 64 - 192 \cos A$

$-39 = -192 \cos A$

$A = 78.28$

"C" $180 - 78.28 - 64.7 = 37.02°$

36 c)

$a = 9$
$b = 10$
$c = 6.87$
$A = 61.23°$
$B = 76.77°$
$C = 42$

"c"

$c^2 = 9^2 + 10^2 - 2(9)(10)\cos 42$

$c^2 = 47$

$c = \sqrt{41} \approx$

"A"

$9^2 = 10^2 + (\sqrt{47})^2 - 2(10)(\sqrt{47})\cos A$

$-66 = -137.11 \cos A$

$A = 61.23°$

"B" $= 180 - 61.23 - 42$

36 d)

$a = 5$
$b = 5.69$
$c = 2.32$
$A = 36$
$B = 42$
$C = 102$

"b"

$\frac{\sin 36}{5} = \frac{\sin 42}{b}$

"c"

$\frac{\sin 36}{5} = \frac{\sin 102}{c}$

"C" $180 - 36 - 42 = 102$

36e) SAS check for 2 Δ's.

$a = 18$, $b = 25$, $c =$, $A = 63$, $B =$, $C =$

$a_2 = 18$, $b_2 = 25$, $C_2 =$, $A_2 = 63$, $B_2 =$, $C_2 =$

$\frac{\sin 63}{18} = \frac{\sin B}{25}$ no sin.

no Δ.

36f)

$a = 4$, $b = 6$, $c = 9.08$, $A = 20$, $B = 30.9$, $C = 129.1$

$a_2 = 4$, $b_2 = 6$, $c_2 = 2.2$, $A_2 = 20$, $B_2 = 149.1$, $C_2 = 10.9$

"B"

$\frac{\sin 20}{4} = \frac{\sin B}{6}$

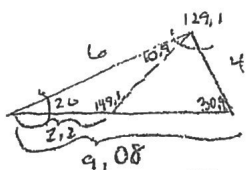
$B_1 = 30.9$

B_2 $180 - 30.9 = 149.1$

C_1	C_2
$\frac{\sin 20}{4} = \frac{\sin 129.1}{c}$	$\frac{\sin 20}{4} = \frac{\sin 10.9}{c}$
$c_1 = 9.08$	$c_2 = 2.2$

$C_1 = 180 - 20 - 30.9 = 129.1$

$C_2 = 180 - 20 - 149.1 = 10.9$



37) a) $A = \frac{1}{2}bc\sin A$

$A = \frac{1}{2}(12)(17)\sin 95$

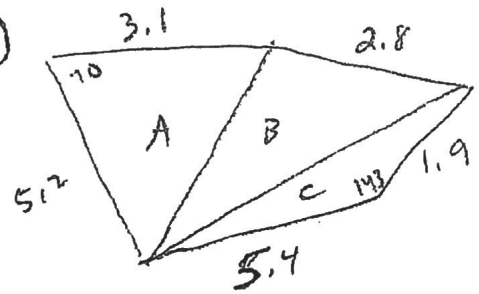
$A \approx 108\ m^2$

37b) $s = \frac{44+47+53}{2} = 72$

$A = \sqrt{72(72-44)(72-47)(72-53)}$

$A \approx 978.57\ units^2$

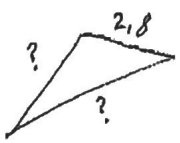
38)



(A) $A = \frac{1}{2}(5.2)(3.1)\sin 70 \approx 7.57$

(C) $A = \frac{1}{2}(5.4)(1.9)\sin 143 \approx 3.087$

(B)



$c^2 = 5.2^2 + 3.1^2 - 2(5.2)(3.1)\cos 70 \approx \sqrt{25.6} \approx 5.06$

$c^2 = 5.4^2 + 1.9^2 - 2(5.4)(1.9)\cos 143 \approx \sqrt{49.12} \approx 7.01$

Area "B" $s = \frac{2.8 + 5.06 + 7.01}{2} = 7.43$

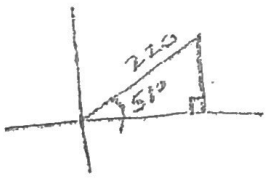
$A_B = \sqrt{7.43(7.43-5.06)(7.43-7.01)(7.43-2.8)}$

$A_B = 5.65$

$A = 7.57 + 3.087 + 5.65$

$A \approx 16.51\ ft^2$

39

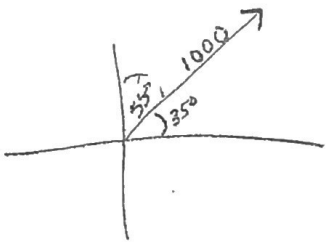


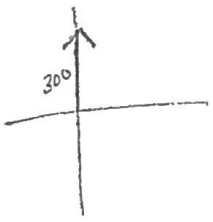
$\langle 138.5, 171.7 \rangle$

$\langle 220\cos 51, 220\sin 51 \rangle$

horizontal, vertical

40





$\langle 1000\cos 35, 1000\sin 35 \rangle$

$\langle 819.15, 573.58 \rangle$

$+ \langle 300\cos 90, 300\sin 90 \rangle$

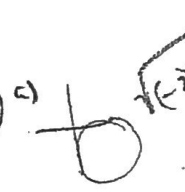
$\langle 0, 300 \rangle$

$\langle 819.15, 873.58 \rangle$

$\sqrt{(819.15)^2 + (873.58)^2} \approx 1197.56 \text{ ft}$

$\tan^{-1}\left(\frac{873.58}{819.15}\right) \approx 46.84°$

41 a)



$\tan^{-1}\left(\frac{-2}{2}\right)$

$\tan^{-1}(-1)$

$\theta = 330°$ or $-60°$

b)

c)

$\tan^{-1}\left(\frac{5}{-2}\right)$

$-68.2 + 180$

$111.8°$

$\sqrt{5^2 + (-2)^2}$

$\sqrt{29} = \text{mag}$

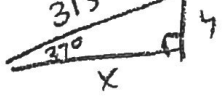
42

$\langle 12\cos 120, 12\sin 120 \rangle$

$\langle 12\left(-\frac{1}{2}\right), 12\left(\frac{\sqrt{3}}{2}\right) \rangle$

$\langle -6, 6\sqrt{3} \rangle$ exact

43



$\langle 315\cos 37°, 315\sin 37° \rangle$

$\langle 252, 190 \rangle$

horizontal, vertical

(44) $x = 150 \cos 30t$

$\boxed{x = 129.9t}$

(a) $y = -\frac{1}{2}(32)t^2 + 150 \sin 30t + 0$

$\boxed{y = -16t^2 + 75t}$

(b) $y = -16(1)^2 + 75(1) = 59$ ft

(c)  4.69 sec

(d)  2.34 sec

(e)  ≈ 7.89 ft

(f) $x = 129.9(4.69) = 609.23$ ft

(45) use calc $\begin{bmatrix} 5 & 3 & 10 \\ -7 & 7 & \end{bmatrix}$

(46) $\begin{bmatrix} 2 & 7 & -2 \\ -1 & 3 & -6 \\ -2 & 4 & -3 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 5 \\ 12 \\ 14 \end{bmatrix}$

$x \approx -3.07$
$y \approx 1.36$
$z \approx -.81$