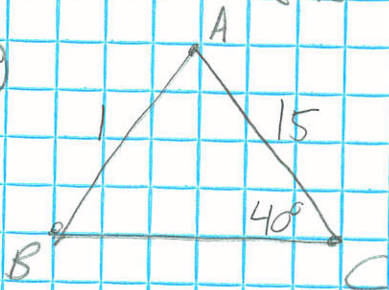


## Semester 2 Review

①

①

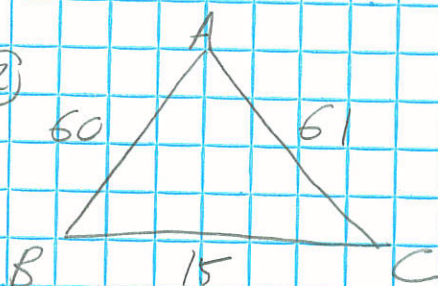


$$\frac{\sin 40}{1} = \frac{\sin B}{15}$$

$$B = \sin^{-1}\left(\frac{15 \sin 40}{1}\right)$$

$B \approx$  no solution

②



$$61^2 = 60^2 + 15^2 - 2(60)(15) \cos B$$

$$-104 = -1800 \cos B$$

$$\frac{104}{1800} = \cos B$$

$$\angle B = 86.688^\circ$$

$$\frac{\sin A}{15} = \frac{\sin 86.688^\circ}{61}$$

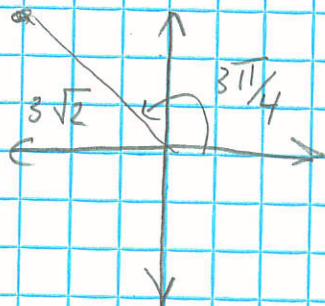
$$A = \sin^{-1}\left(\frac{15 \sin 86.688^\circ}{61}\right)$$

$$\angle A \approx 14.211^\circ$$

$$\angle C \approx 180 - 86.688 - 14.211$$

$$\angle C \approx 79.101^\circ$$

③



$$3\sqrt{2} \left( \cos \frac{3\pi}{4} + i \sin \frac{3\pi}{4} \right)$$

④

$$6 \cos \frac{-5\pi}{6} + i \cdot 6 \sin \frac{-5\pi}{6}$$

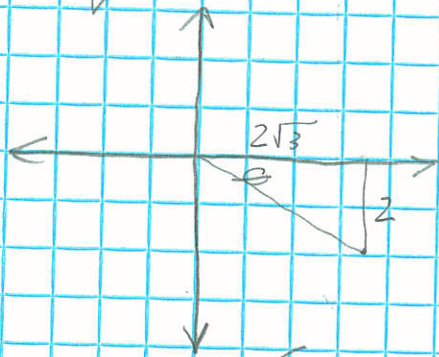
$$6 \cos \frac{7\pi}{6} + 6i \sin \frac{7\pi}{6}$$

$$6 \cdot \frac{-\sqrt{3}}{2} + 6i \cdot \frac{-1}{2}$$

$$-3\sqrt{3} - 3i$$

$$\textcircled{5} \quad z = 6\sqrt{2} \left( \cos \frac{7\pi}{4} + i \sin \frac{7\pi}{4} \right)$$

$$w = 4 \left( \cos \frac{\pi}{2} + i \sin \frac{\pi}{2} \right)$$



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

$$\theta = \frac{\pi}{6}$$

$$r = \sqrt{2^2 + (2\sqrt{3})^2} = \sqrt{4+12} = 4$$

$$v = 4 \left( \cos \frac{11\pi}{6} + i \sin \frac{11\pi}{6} \right)$$

$$\text{a) } 24\sqrt{2} \left( \cos \frac{9\pi}{4} - i \sin \frac{9\pi}{4} \right)$$

$$= 24\sqrt{2} \left( \cos \frac{\pi}{4} - i \sin \frac{\pi}{4} \right)$$

$$\text{b) } 1 \left( \cos \frac{-8\pi}{6} + i \sin \frac{-8\pi}{6} \right)$$

$$= 1 \left( \cos \frac{-4\pi}{3} + i \sin \frac{-4\pi}{3} \right)$$

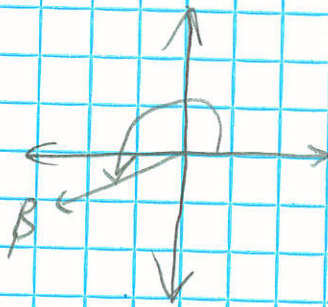
$$= 1 \left( \cos \frac{2\pi}{3} + i \sin \frac{2\pi}{3} \right)$$

$$\text{c) } 64 \left( \cos \frac{33\pi}{6} + i \sin \frac{33\pi}{6} \right)$$

$$= 64 \left( \cos \frac{11\pi}{2} + i \sin \frac{11\pi}{2} \right)$$

$$= 64 \left( \cos \frac{3\pi}{2} + i \sin \frac{3\pi}{2} \right)$$

$$\textcircled{6} \quad \beta = \frac{-5\pi}{6} = \frac{7\pi}{6} = 210^\circ$$

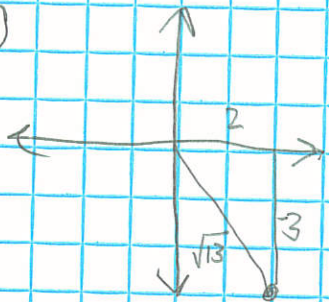


- $\textcircled{7}$
- a)  $-\sqrt{3}/2$
  - b) undefined
  - c)  $1/2$
  - d)  $2$
  - e)  $\sqrt{3}$
  - f)  $\sqrt{2}$

- 8) a)  $\frac{IV}{II}$   
 b)  $\frac{III}{II}$

3

9)

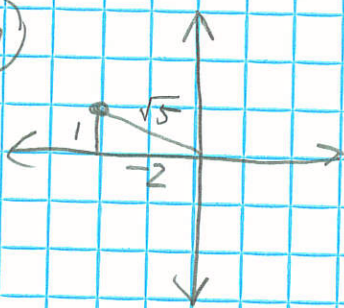


$$\csc B = \frac{r}{y} = \frac{\sqrt{13}}{3}$$

$$\cos B = \frac{x}{r} = \frac{2}{\sqrt{13}} = \frac{2\sqrt{13}}{13}$$

$$\cot B = \frac{x}{y} = \frac{2}{3}$$

10)



$$\sin \alpha = \frac{y}{r} = \frac{1}{\sqrt{5}} = \frac{\sqrt{5}}{5}$$

$$\cos \alpha = \frac{x}{r} = \frac{-2}{\sqrt{5}} = \frac{-2\sqrt{5}}{5}$$

11)

- a) true
- b) false
- c) true
- d) false
- e) true
- f) true
- g) false

12)

a) 7

b)  $\rho b = 2\pi$

$\rho \cdot \frac{1}{2} = 2\pi$

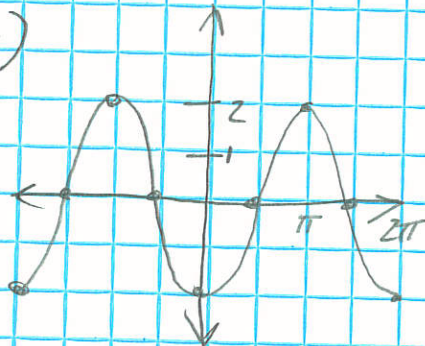
$\rho = 4\pi$

c)  $\frac{1}{2}x - \pi = \frac{1}{2}(x - 2\pi)$   $2\pi$  right

d) 1 up

13)

a)



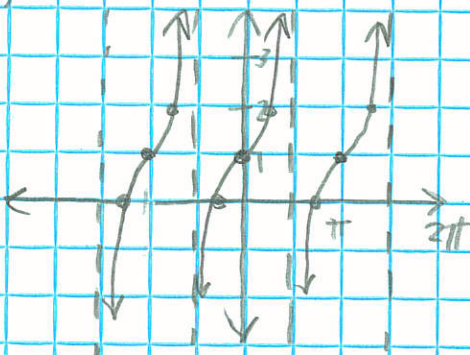
(13) b)  $p = \pi$

(4)



shifting by the period  
is meaningless

c)



(14) period  $2\pi$   
horiz  $\pi/4$  left  
amp 1  
vert 0

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

(15) period  $\pi$   $b = 2$   
amp -1  
horiz 0  
vert -1

$$y = -\sin(2x) - 1$$

(16) a)  $0.5678$  since angle is in quadrant I

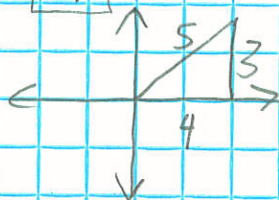
b)  $\frac{7\pi}{12}$  is in quadrant II ( $105^\circ$ )

arcsin gives answer in I or IV

$\frac{5\pi}{12}$  ( $75^\circ$ )

c)  $\frac{3\pi}{4}$  arccos gives answer in I or II

d) note arcsin gives answer in I or IV



$\frac{3}{4}$

(17) a)  $\theta = \frac{7\pi}{12}, \frac{11\pi}{12}$

(5)

b)  $\theta = 0, \pi$

(18) a)  $\frac{\sin^2 x}{\sec^2 x - 1} = \cos^2 x$   $\tan^2 x + 1 = \sec^2 x$   
 $\tan^2 x = \sec^2 x - 1$   
 $\frac{\sin^2 x}{\tan^2 x} =$   
 $\sin^2 x \div \frac{\sin^2 x}{\cos^2 x} =$   
 $\frac{\cancel{\sin^2 x} \cdot \cos^2 x}{\cancel{\sin^2 x}} =$   
 $\sqrt{\cos^2 x} =$

b)  $\frac{\sec x}{\cos x} - \sec x \cos x = \tan^2 x$

$$\frac{1}{\cos x} \div \cos x - \frac{1}{\cos x} \cdot \cos x =$$

$$\frac{1}{\cos x} \cdot \frac{1}{\cos x} - 1 =$$

$$\frac{1}{\cos^2 x} - 1 =$$

$$\sec^2 x - 1 =$$

$$\sqrt{\tan^2 x} =$$

$$(\text{since } \tan^2 x + 1 = \sec^2 x \quad \tan^2 x = \sec^2 x - 1)$$

(19)

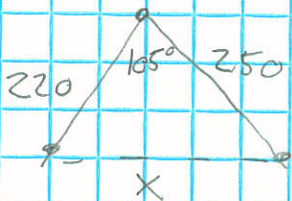


$$\frac{\sin x}{120} = \frac{\sin 103.2^\circ}{160}$$

$$x = \sin^{-1} \left( \frac{120 \sin 103.2^\circ}{160} \right)$$

$$x \approx 46.902^\circ$$

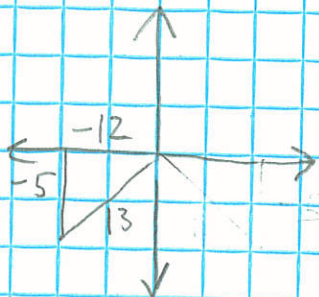
(20)



$$x^2 = 220^2 + 250^2 - 2(220)(250) \cos 105^\circ$$

$$x \approx \boxed{373.323} \text{ meters}$$

(21)



a)  $\sin(2x) = 2 \sin x \cos x$   
 $= 2 \left(\frac{-5}{13}\right) \left(\frac{-12}{13}\right)$   
 $= \frac{120}{169}$

(6)

b)  $\cos\left(\frac{x}{2}\right) = \pm \sqrt{\frac{1 + \cos \theta}{2}}$

Part (b) is negative because since  $\theta$  is between 180 and 270  $\theta/2$  is between 90 and 135 (quadrant II)

$$= \pm \sqrt{\frac{1 + \frac{-12}{13}}{2}}$$

$$= \pm \sqrt{\frac{1/13}{2}}$$

$$= \pm \sqrt{\frac{1}{26}} = \pm \frac{\sqrt{26}}{26}$$

(22)

a)  $\sin x = \frac{3}{4 \sin x}$

$$\sin^2 x = \frac{3}{4}$$

$$\sin x = \pm \frac{\sqrt{3}}{2}$$

$$x = \frac{\pi}{3}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{5\pi}{3}$$

b)  $3 \cos^2 x + \cos x - 2 = 0$

$$3u^2 + u - 2 = 0$$

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

$$u = \frac{2}{3} \text{ or } u = -1$$

$$\cos x = -1$$

$$x = \pi$$

$$\cos x = \frac{2}{3}$$

$$x \approx 0.8411 \text{ or } 2\pi - 0.8411$$

$$5.4421$$

c)  $2 \cos^2 x - 3 \sin x - 2 = 0$

$$2(1 - \sin^2 x) - 3 \sin x - 2 = 0$$

$$2(1 - u^2) - 3u - 2 = 0$$

$$2 - 2u^2 - 3u - 2 = 0$$

$$-2u^2 - 3u = 0$$

$$u(2u + 3) = 0$$

$$u = 0$$

$$\sin x = 0$$

$$x = 0, \pi$$

$$u = -3/2$$

no solution

d)  $\cos(2x) = 0$

$$2 \cos^2 x - 1 = 0$$

$$2 \cos^2 x = 1$$

$$\cos^2 x = \frac{1}{2}$$

$$\cos x = \pm \frac{1}{\sqrt{2}}$$

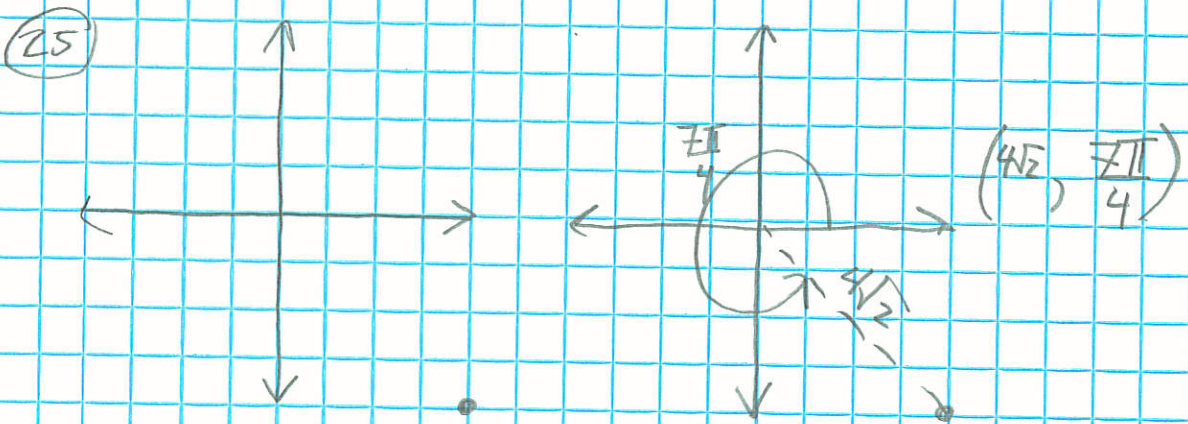
$$\cos x = \pm \frac{\sqrt{2}}{2}$$

$$x = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$$

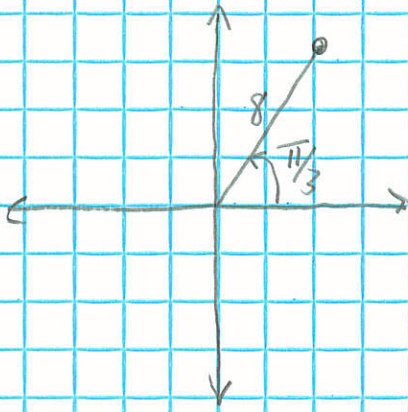
23) a)  $\sin(2x) = -\cos x$   
 $2 \sin x \cos x = -\cos x$   
 $2 \sin x \cos x + \cos x = 0$   
 $\cos x (2 \sin x + 1) = 0$   
 $\cos x = 0 \quad \sin x = -1/2$   
 $x = \frac{\pi}{2}, \frac{3\pi}{2} \quad x = \frac{7\pi}{6}, \frac{11\pi}{6}$

b)  $2 \sin(2x) = \tan x$   
 $4 \sin x \cos x = \frac{\sin x}{\cos x}$   
 $4 \sin x \cos^2 x = \sin x$   
 $4 \sin x \cos^2 x - \sin x = 0$   
 $\sin x (4 \cos^2 x - 1) = 0$   
 $\sin x = 0 \quad 4 \cos^2 x - 1 = 0$   
 $x = 0, \pi \quad \cos^2 x = 1/4$   
 $\cos x = \pm 1/2$   
 $x = \pi/3, 2\pi/3, 4\pi/3, 5\pi/3$

24)  $\cos\left(\frac{5\pi}{12}\right) = \cos(75^\circ) = \cos(30 + 45)^\circ$   
 $= \cos 30 \cos 45 - \sin 30 \sin 45$   
 $= \frac{\sqrt{3}}{2} \cdot \frac{\sqrt{2}}{2} - \frac{1}{2} \cdot \frac{\sqrt{2}}{2}$   
 $= \frac{\sqrt{6} - \sqrt{2}}{4}$



$$(26) \left(8, -\frac{5\pi}{3}\right) = \left(8, \frac{\pi}{3}\right)$$

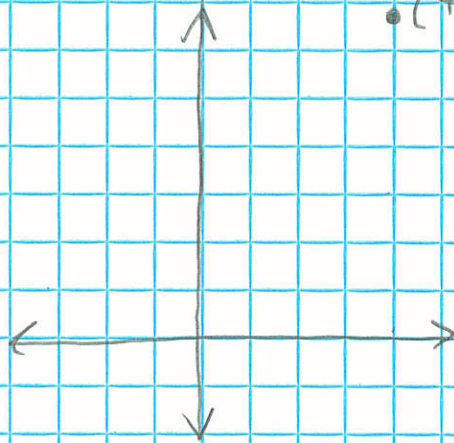


$$8 \cos \frac{\pi}{3}, 8 \sin \frac{\pi}{3}$$

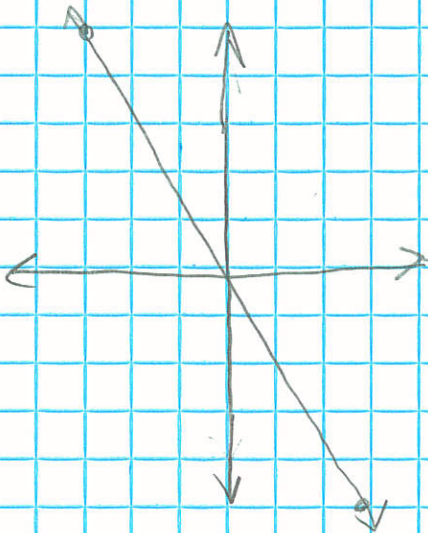
$$8 \cdot \frac{1}{2}, 8 \cdot \frac{\sqrt{3}}{2}$$

$$(4, 4\sqrt{3})$$

$$(4, 4\sqrt{3})$$



(27)

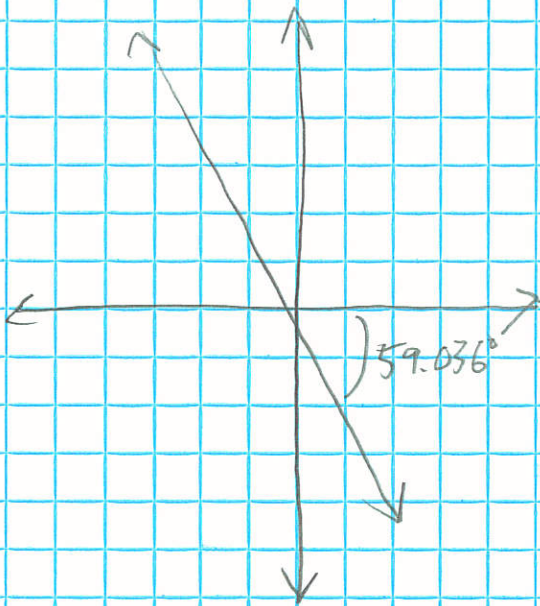


$$r \sin \theta = -\frac{5}{3}, r \cos \theta$$

$$\tan \theta = -\frac{5}{3}$$

$$\theta = \tan^{-1}\left(-\frac{5}{3}\right)$$

$$\theta \approx -1.030 \text{ or } -59.036^\circ$$

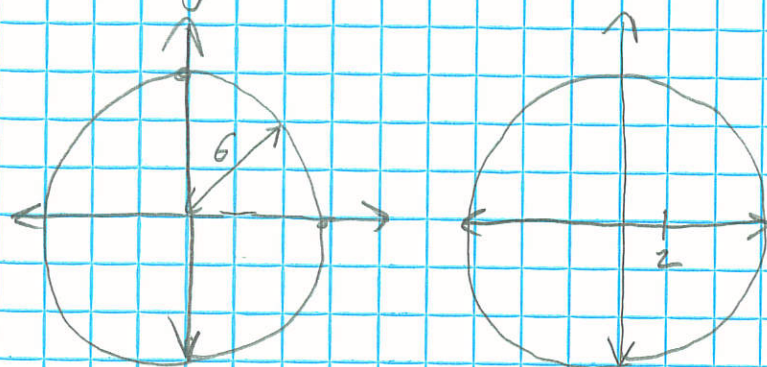


(28)

$$r = 6$$

$$\sqrt{x^2 + y^2} = 6$$

$$x^2 + y^2 = 36$$



(9)

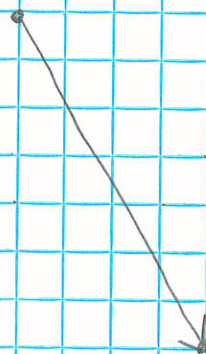
(29)

$$V = \langle 7, 0 \rangle$$

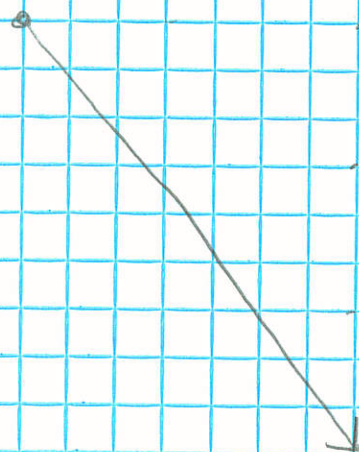
$$W = \langle -3, -7 \rangle$$

$$u = \langle -5, 1 \rangle$$

a)  $v + w = \langle 4, -7 \rangle$



b)  $w - 2u = \langle 7, -9 \rangle$



30) a)  $\vec{v} = \langle 7, 0 \rangle$

b)  $\vec{v} = 7 \langle \cos 0, \sin 0 \rangle$

c)  $\vec{w} = \langle -3, -7 \rangle$

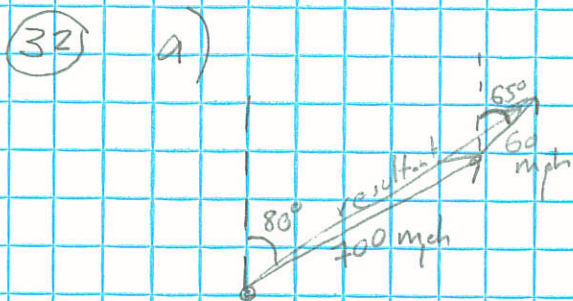
d)  $\vec{w} = \sqrt{58} \langle \cos 246.801, \sin 246.801 \rangle$

$$\theta = \tan^{-1}\left(\frac{-7}{-3}\right) + 180 \approx 246.801$$

e)  $\|u\| = \sqrt{26} \left\langle \frac{-5}{\sqrt{26}}, \frac{1}{\sqrt{26}} \right\rangle = \left\langle \frac{-5\sqrt{26}}{26}, \frac{\sqrt{26}}{26} \right\rangle$

31) b)  $-u = \langle 5, -1 \rangle$   
 $3w = \langle -9, -21 \rangle$   
 $\langle -4, -22 \rangle$

a)  $u = \langle -5, 1 \rangle$   
 $v = \langle 7, 0 \rangle$   
 $\langle 2, 1 \rangle$



b) plane  $700 \langle \cos 10^\circ, \sin 10^\circ \rangle$   
 $\langle 689.365, 121.554 \rangle$   
 wind  $60 \langle \cos 25^\circ, \sin 25^\circ \rangle$   
 $\langle 54.378, 25.357 \rangle$

c)  $\langle 743.743, 146.911 \rangle$

d)  $\sqrt{743.743^2 + 146.911^2}$   
 $\approx 758.114 \text{ mph}$

e)  $\theta \approx \tan^{-1} \left( \frac{146.911}{743.743} \right)$

$\theta \approx 11.174$

bearing =  $90 - 11.174$   
 $= 78.826^\circ$

33) a)  $3 \times 2$   
 b)  $2$

c)  $2A = \begin{bmatrix} 0 & 6 \\ 2 & -4 \\ -4 & 8 \end{bmatrix}$   $B = \begin{bmatrix} -4 & -1 \\ 0 & 5 \\ -3 & 2 \end{bmatrix}$   $2A - B = \begin{bmatrix} 4 & 7 \\ 2 & -9 \\ -1 & 6 \end{bmatrix}$

d)  $1 \times 3$   $3 \times 1$   
 $1 \times 1$   $(1)(3) + (2)(-2) + (0)(1) = [-1]$

e)  $[3 \ 6 \ 0]$

f) not possible

g)  $3 \times 2$  by  $2 \times 2$

$$\begin{bmatrix} -4 & -1 \\ 0 & 5 \\ -3 & 2 \end{bmatrix} \begin{bmatrix} 3 & -4 \\ 1 & -2 \end{bmatrix} = \begin{bmatrix} (-4)(3) + (-1)(1) & (-4)(-4) + (-1)(-2) \\ (0)(3) + (5)(1) & (0)(-4) + (5)(-2) \\ (-3)(3) + (2)(1) & (-3)(-4) + (2)(-2) \end{bmatrix}$$

$$= \begin{bmatrix} -13 & 18 \\ 5 & -10 \\ -7 & 8 \end{bmatrix}$$

h)  $\frac{1}{ad-bc} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix} = \frac{1}{-2} \begin{bmatrix} -2 & 4 \\ -1 & 3 \end{bmatrix} = \begin{bmatrix} 1 & -2 \\ \frac{1}{2} & -\frac{3}{2} \end{bmatrix}$

(11)

(34)

$$\left[ \begin{array}{ccc|c} 1 & 1 & 1 & -2 \\ 2 & -1 & -1 & -1 \\ 3 & 2 & 4 & -15 \\ -2 & -2 & -2 & 4 \\ -3 & -3 & -3 & 6 \end{array} \right]$$

$$\left[ \begin{array}{ccc|c} 1 & 1 & 1 & -2 \\ 0 & -3 & -3 & 3 \\ 0 & -1 & 1 & -9 \\ 0 & 3 & -3 & 27 \end{array} \right]$$

$$\left[ \begin{array}{ccc|c} 1 & 1 & 1 & -2 \\ 0 & 0 & -6 & 30 \\ 0 & -1 & 1 & -9 \end{array} \right]$$

add  $-2[1]$  to  $[2]$   
 $-3[1]$  to  $[3]$   
 add  $3[3]$  to  $[2]$   
 mult  $1/6 [2]$   
 mult  $-1 [3]$   
 switch  $[2]$  and  $[3]$

$$\left[ \begin{array}{ccc|c} 1 & 1 & 1 & -2 \\ 0 & 0 & 1 & -5 \\ 0 & -1 & -1 & 9 \end{array} \right]$$

$$\left[ \begin{array}{ccc|c} 1 & 1 & 1 & -2 \\ 0 & 1 & -1 & 9 \\ 0 & 0 & 1 & -5 \end{array} \right]$$

$$z = -5$$

$$y - z = 9$$

$$y + 5 = 9$$

$$y = 4$$

$$x + y + z = -2$$

$$x + 4 - 5 = -2$$

$$x = -1$$

$$\boxed{(-1, 4, -5)}$$

(35)

$$\begin{bmatrix} 3 & 1 \\ 2 & -3 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 7 \\ 1 \end{bmatrix}$$

$A = X \quad B$

$$A^{-1} = \frac{1}{-9-2} \begin{bmatrix} -3 & -1 \\ -2 & 3 \end{bmatrix}$$

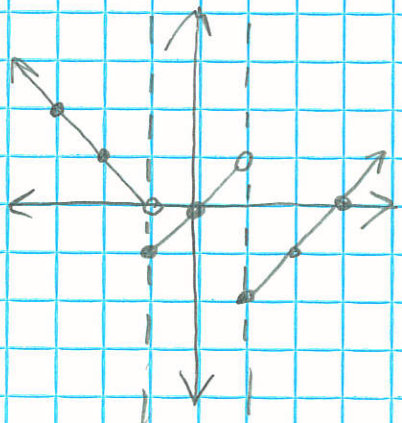
$$= \begin{bmatrix} 3/11 & 1/11 \\ 2/11 & -3/11 \end{bmatrix}$$

$$\begin{bmatrix} 3/11 & 1/11 \\ 2/11 & -3/11 \end{bmatrix} \begin{bmatrix} 7 \\ 1 \end{bmatrix}$$

$$\begin{bmatrix} (3/11)(7) + (1/11)(1) \\ (2/11)(7) + (-3/11)(1) \end{bmatrix} = \begin{bmatrix} 22/11 \\ 11/11 \end{bmatrix} = \begin{bmatrix} 2 \\ 1 \end{bmatrix} \quad (2, 1)$$

(36)

x	y
-3	2
-2	1
-1	-1
0	0
1	-2
2	-1
3	0



- a)  $(-\infty, \infty)$
- b)  $[2, \infty)$
- c)  $[-1, 1) \cup [1, \infty)$
- d)  $(-\infty, -1)$
- e)  $\emptyset$

$$(37) \quad f(x) = \frac{x(x^2 + 2x - 3)}{(x-1)(x-2)} = \frac{x(x+3)(x-1)}{(x-1)(x-2)}$$

(12)

a) 0, -3

b) 0

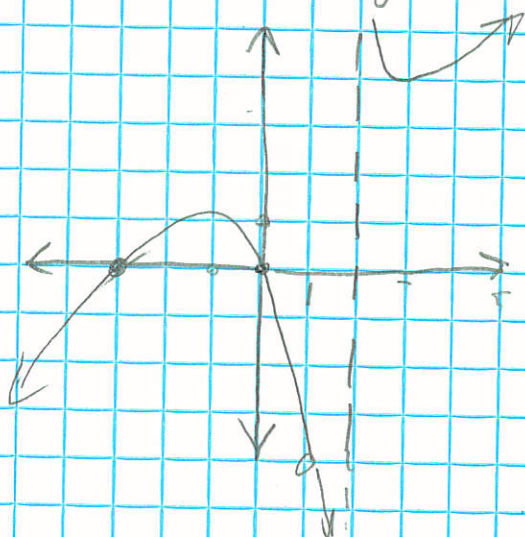
c)  $x = 2$

d)

$$x^2 - 3x + 2 \quad \begin{array}{r} x+5 \\ \hline x^3 + 2x^2 - 3x + 0 \\ x^3 - 3x^2 + 2x \\ \hline 5x^2 - 5x + 0 \\ 5x^2 - 15x + 10 \\ \hline 10x - 10 \end{array}$$

$$y = x + 5$$

e)  $x = 1 \quad y = 1(4)/-1 = -4 \quad (1, -4)$



Note slant asymptote not shown due to space issues

$$(38) \quad \begin{aligned} \sqrt{2x-5} &= 1 + \sqrt{x-3} \\ 2x-5 &= 1 + 2\sqrt{x-3} + x-3 \\ x-3 &= 2\sqrt{x-3} \end{aligned}$$

$$x^2 - 6x + 9 = 4(x-3)$$

$$x^2 - 6x + 9 = 4x - 12$$

$$x^2 - 10x + 21 = 0$$

$$(x-3)(x-7) = 0$$

$$x=3 \quad x=7$$

both valid

$$(39) \quad \frac{x^2 + 8}{x(x^2 + 3x + 2)} = \frac{x^2 + 8}{x(x+1)(x+2)} = \frac{A}{x} + \frac{B}{x+1} + \frac{C}{x+2} \quad (13)$$

$$\frac{A(x+1)(x+2)}{x(x+1)(x+2)} + \frac{Bx(x+2)}{x(x+1)(x+2)} + \frac{Cx(x+1)}{x(x+1)(x+2)}$$

$$\frac{Ax^2 + 3Ax + 2A}{x(x+1)(x+2)} + \frac{Bx^2 + 2Bx}{x(x+1)(x+2)} + \frac{Cx^2 + Cx}{x(x+1)(x+2)}$$

$$A + B + C = 1$$

$$3A + 2B + C = 0$$

$$2A = 8$$

$$A = 4$$

$$4 + B + C = 1$$

$$B + C = -3$$

$$12 + 2B + C = 0$$

$$2B + C = -12$$

$$B = -9$$

$$C = 6$$

$$\frac{4}{x} + \frac{-9}{x+1} + \frac{6}{x+2}$$

$$(40) \quad \log(3x+7) + \log(x-2) = 1$$

$$\log_{10} [(3x+7)(x-2)] = 1$$

$$10^1 = 3x^2 + x - 14$$

$$0 = 3x^2 + x - 24$$

$$0 = (3x-8)(x+3)$$

$$x = \frac{8}{3} \quad \text{or} \quad x = -3$$

invalid

$$(41) \quad 3^{1-x} = 5^x$$

$$(1-x) \log 3 = x \log 5$$

$$\log 3 - x \log 3 = x \log 5$$

$$\log 3 = x \log 3 + x \log 5$$

$$\log 3 = x(\log 3 + \log 5)$$

$$x = \frac{\log 3}{\log 3 + \log 5}$$

(42)

$$9(x^2 - 2x) + 4(y^2 + 4y) = 119$$

$$9(x^2 - 2x + 1) + 4(y^2 + 4y + 4) = 119 + 9 + 16$$

$$9(x-1)^2 + 4(y+2)^2 = 144$$

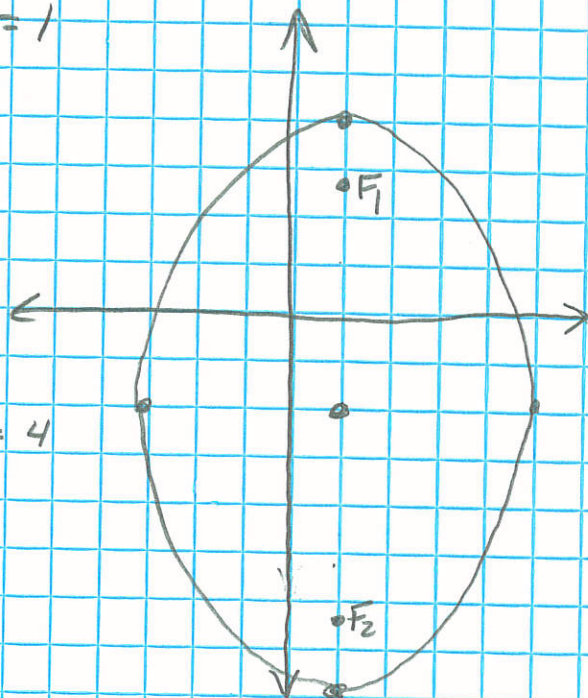
$$\frac{(x-1)^2}{16} + \frac{(y+2)^2}{36} = 1$$

center  $(1, -2)$ 

$$a = 6$$

$$b = 4$$

$$c = \sqrt{a^2 - b^2} = 2\sqrt{5}$$

foci  $(1, -2 \pm 2\sqrt{5})$ 

(14)

(43)

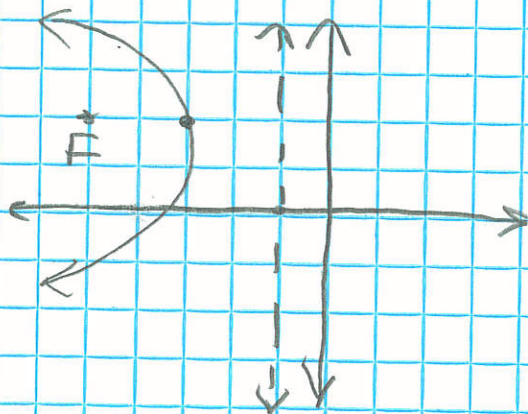
$$y^2 - 4y + 4 + 8x + 28 = 4$$

$$(y-2)^2 = -8x - 24$$

$$(y-2)^2 = -8(x+3)$$

Vertex  $(-3, 2)$ 

$$p = -2$$

focus  $(-5, 2)$ directrix  $x = -1$ 

(44)

Show true for  $n=1$  Assume true for  $n=k$ , show true for  $n=k+1$

$$1 = \frac{1}{2}(3 \cdot 1 - 1)$$

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

$$1 = 1 \checkmark$$

$$\frac{3k^2 + 5k + 2}{2} =$$

$$\frac{(3k+2)(k+1)}{2} =$$

$$1 + 4 + \dots + 3k - 2 + [3(k+1) - 2]$$

$$= \frac{k+1}{2} [3(k+1) - 1]$$

$$\frac{k(3k-1)}{2} + 3k+1 = \frac{k+1}{2} (3k+2)$$

$$\frac{k(3k-1) + 2(3k+1)}{2} = \frac{(k+1)(3k+2)}{2}$$

$$\frac{3k^2 - k + 6k + 2}{2} =$$

$$\begin{array}{l}
 (45) \left[ \begin{array}{ccc|c} 2 & 4 & 1 & 1 \\ 1 & -2 & -3 & 2 \\ 1 & 1 & -1 & -1 \\ \hline -2 & 4 & 6 & -4 \\ -1 & 2 & 3 & -2 \\ \hline 0 & 8 & 7 & -3 \\ 1 & -2 & -3 & 2 \\ 0 & 3 & 2 & -3 \\ 0 & -3 & -2\frac{1}{8} & \frac{9}{8} \\ \hline 0 & 8 & 7 & -3 \\ 1 & -2 & -3 & 2 \\ 0 & 0 & -\frac{5}{8} & -\frac{15}{8} \\ \hline 0 & 1 & \frac{7}{8} & -\frac{3}{8} \\ 1 & -2 & -3 & 2 \\ 0 & 0 & 1 & 3 \\ \hline 1 & -2 & -3 & 2 \\ 0 & 1 & \frac{7}{8} & -\frac{3}{8} \\ 0 & 0 & 1 & 3 \end{array} \right]
 \end{array}$$

Add  $-2[2]$  to  $[1]$

Add  $-1[2]$  to  $[3]$

Add  $-\frac{3}{8}[1]$  to  $[3]$

Mult.  $-\frac{8}{5}[3]$

Mult  $\frac{1}{8}[1]$

Swap  $[1]$  and  $[2]$

$$z = 3$$

$$y + \frac{7}{8} \cdot 3 = -\frac{3}{8}$$

$$y + \frac{21}{8} = -\frac{3}{8}$$

$$y = -\frac{24}{8} = -3$$

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

$$x - 3 = 2$$

$$x = 5$$

$$\boxed{(5, -3, 3)}$$

- (46) a) arithmetic  
b)  $5n - 24$   
c)  $76$

- (47) a) neither  
b)  $\frac{n+1}{n}$   
c)  $\frac{21}{20}$

- (48) a) geometric  
b)  $3(-4)^{n-1}$   
c)  $3(-4)^{19}$

- (49)  $a_1 = 3$   
 $a_{25} = 51$

$$S_{25} = \frac{25}{2}(3+51)$$

$$= \frac{25 \cdot 54}{2}$$

$$= \frac{1350}{2}$$

$$= \boxed{675}$$

(15)

(50)  $S_{\infty} = \frac{1}{1 - (-\frac{1}{3})}$   
 $= \frac{1}{\frac{4}{3}}$   
 $= \frac{3}{4}$

(51)  $S_{10} = \frac{3(1 - (-2)^{10})}{1 - (-2)}$   
 $S_{10} \approx -1023$

52) a)  $2x^2 - 14x + 24 = 0$   
 $x^2 - 7x + 12 = 0$   
 $(x-3)(x-4) = 0$   
 $x = 3 \text{ or } 4$

b)  $x(4x^3 - 11x^2 - 22x + 8) = 0$   
 $x = 4$  is a zero (from graphing calc)

4  $\begin{array}{cccc} 4 & -11 & -22 & 8 \\ 0 & 16 & 20 & -8 \\ 4 & 5 & -2 & 0 \end{array}$   
 $x(x-4)(4x^2 + 5x - 2)$

$x = \frac{-5 \pm \sqrt{25 - 4(4)(-2)}}{8}$   
 $x = \frac{-5 \pm \sqrt{57}}{8}$

$x = 0, 4, \frac{-5 \pm \sqrt{57}}{8}$

c)  $\left[ \frac{7}{8}x^2 - \frac{3}{4}x + \frac{5}{16} = 0 \right] \cdot 16$

$14x^2 - 12x + 5 = 0$   
 $x = \frac{12 \pm \sqrt{(-12)^2 - 4(14)(5)}}{28}$

$x = \frac{12 \pm \sqrt{-136}}{28}$

$x = \frac{12 \pm 2i\sqrt{34}}{28}$

$x = \frac{6 \pm i\sqrt{34}}{14}$

d)  $-2$  is a zero

$-2 \begin{array}{cccc} 1 & 4 & 14 & 20 \\ 0 & -2 & -4 & -20 \\ 1 & 2 & 10 & 0 \end{array}$

$x = -2, -1 \pm 3i$

$(x+2)(x^2 + 2x + 10) = 0$

$x = \frac{-2 \pm \sqrt{(2)^2 - 4(1)(10)}}{2}$

$x = \frac{-2 \pm \sqrt{-36}}{2}$

$x = \frac{-2 \pm 6i}{2} = -1 \pm 3i$

e)  $4e^{2x} = 5$   
 $e^{2x} = \frac{5}{4}$   
 $\ln e^{2x} = \ln \frac{5}{4}$   
 $2x = \ln \frac{5}{4}$

$x = \frac{\ln \frac{5}{4}}{2}$

(52) Continued

(17)

f)  $2(3^{2t-5}) - 4 = 11$

$2(3^{2t-5}) = 15$   
 $3^{2t-5} = 15/2$

$(2t-5)(\log 3) = \log \frac{15}{2}$

$2t-5 = \frac{\log \frac{15}{2}}{\log 3}$

$2t = \frac{\log \frac{15}{2}}{\log 3} + 5$

$t = \frac{\log \frac{15}{2}}{2 \log 3} + \frac{5}{2}$

g)  $5 + 2 \ln x = 4$

$2 \ln x = -1$

$\ln x = -1/2$

$x = e^{-1/2}$

h)  $2 \log_5(3x) = 4$

$\log_5(3x) = 2$

$3x = 5^2$

$3x = 25$

$x = 25/3$

i)  $\ln(x+1) - \ln(x-2) = \ln x$

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

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

$x+1 = x^2 - 2x$

$0 = x^2 - 3x - 1$

$x = \frac{3 \pm \sqrt{9 - 4(1)(-1)}}{2}$

$x = \frac{3 \pm \sqrt{13}}{2}$  (minus answer is invalid)

$x = \frac{3 + \sqrt{13}}{2}$

j)  $\cos^3 x = \cos x$

$\cos^3 x - \cos x = 0$

$\cos x(\cos^2 x - 1) = 0$

$\cos x = 0$  or  $\cos^2 x - 1 = 0$

$\cos^2 x = 1$

$\cos x = \pm 1$

$x = \pi/2, 3\pi/2, 0, \pi$

k)  $2 \sec^2 x + \tan^2 x - 3 = 0$

$2(\tan^2 x + 1) + \tan^2 x - 3 = 0$

$3 \tan^2 x - 1 = 0$

$3 \tan^2 x = 1$

$\tan^2 x = 1/3$

$\tan x = \pm \sqrt{1/3} = \pm \frac{\sqrt{3}}{3}$

$x = \frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}$

l)  $4 \sin x = \cos x - 2$

$16 \sin^2 x = (\cos x - 2)^2$

$16(1 - \cos^2 x) = \cos^2 x - 4 \cos x + 4$

$16 - 16 \cos^2 x = \cos^2 x - 4 \cos x + 4$

$0 = 17 \cos^2 x - 4 \cos x - 12$

$17u^2 - 4u - 12 = 0$

$u = \frac{4 \pm \sqrt{16 - 4(17)(-12)}}{34}$

$u = \frac{4 \pm \sqrt{832}}{34}$

$u = \frac{4 \pm 8\sqrt{13}}{34} = \frac{2 \pm 4\sqrt{13}}{17}$

$x = \cos^{-1}\left(\frac{2+4\sqrt{13}}{17}\right), 2\pi - \cos^{-1}\left(\frac{2+4\sqrt{13}}{17}\right)$

or  $x = \cos^{-1}\left(\frac{2-4\sqrt{13}}{17}\right), 2\pi - \cos^{-1}\left(\frac{2-4\sqrt{13}}{17}\right)$

$x \approx 0.261, x \approx 2.390$

$x \approx 3.893, x \approx 6.022$

only two of these work due to squaring both sides