$a^3 - b^3 = (a-b)(a^2 + ab + b^2)$

Midterm Review

Unit 1

$a^3 + b^3 = (a+b)(a^2 - ab + b^2)$

1. Factor completely: $2x^3 + 54$

$2(x^3 + 27)$

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

$\boxed{= 2(x+3)(x^2 - 3x + 9)}$

2. Factor: $3a^3 - 6ab + a^2b - 2b^2$

$3a(a^2 - 2b) + b(a^2 - 2b)$

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

3. Simplify: $\dfrac{b\left(\dfrac{a^2}{b} - \dfrac{b}{1}\right)b}{b\left(\dfrac{a}{b} + \dfrac{1}{1}\right)b}$

$\dfrac{a^2 - b^2}{a + b} = \dfrac{(a+b)(a-b)}{a+b}$

$\boxed{= a - b}$

4. ~~SKIP~~ Simplify: $3 - \dfrac{1 \; (x-3)}{\dfrac{3}{1}(x-3) - \dfrac{3}{x-3}(x-3)}$

$\dfrac{x-3}{3x-9-3}$

$\dfrac{(3x-12)}{(3x-12)}\dfrac{3}{1} - \dfrac{x-3}{3x-12}$

$\dfrac{9x-36-x+3}{3x-12}$

$\boxed{= \dfrac{8x-33}{3x-12}}$

5. Decompose $\dfrac{8x + 17}{x^2 + 3x - 4}$ into partial fractions.

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

$\dfrac{8x+17}{(x+4)(x-1)} = \dfrac{A}{x+4} + \dfrac{B}{x-1}$

$8x + 17 = A(x-1) + B(x+4)$

$\boxed{\therefore \dfrac{8x+17}{x^2+3x-4} = \dfrac{3}{x+4} + \dfrac{5}{x-1}}$

Solve for A:
$x = -4$
$8(-4) + 17 = A(-4-1) + B(-4+4)$
$-15 = -5A + 0$
$\dfrac{-15}{-5} = \dfrac{-5A}{-5}$
$\boxed{A = 3}$

Solve for B:
$x = 1$
$8(1) + 17 = A(1-1) + B(1+4)$
$25 = 0 + 5B$
$\dfrac{25}{5} = \dfrac{5B}{5}$
$\boxed{B = 5}$

6. Solve algebraically:

$$\begin{aligned} x + 2y + 3z &= 5 \\ 3x + 2y - 2z &= -13 \\ 5x + 3y - z &= -11 \end{aligned}$$

See Paper.

Unit 2

7. Evaluate: $5\begin{bmatrix} -2 & 3 & -1 \\ 4 & 5 & -2 \end{bmatrix} - \begin{bmatrix} 3 & -5 & 2 \\ 3 & -1 & -4 \end{bmatrix}$

$$= \begin{bmatrix} -10 & 15 & -5 \\ 20 & 25 & -10 \end{bmatrix} - \begin{bmatrix} 3 & -5 & 2 \\ 3 & -1 & -4 \end{bmatrix}$$

$$\boxed{= \begin{bmatrix} 7 & 20 & -7 \\ 17 & 26 & -6 \end{bmatrix}}$$

8. Evaluate: $\begin{vmatrix} 2 & -3 \\ 7 & 4 \end{vmatrix}$

$= 2(4) - (-3)(7)$

$= 8 - (-21)$

$\boxed{= 29}$

9. Evaluate: $\left|\begin{array}{ccc|cc} -1 & -3 & 2 & -1 & -3 \\ 6 & 5 & -4 & 6 & 5 \\ 7 & -8 & 2 & 7 & -8 \end{array}\right|$

$= -10 + 84 + (-96) - (-36) - (-32)$

-70

$\boxed{= -24}$

10. Evaluate: $\begin{bmatrix} 5 & -3 \\ 2 & 8 \end{bmatrix}\begin{bmatrix} -2 & 9 & 1 \\ 4 & -6 & 3 \end{bmatrix}$

$2 \times 2 \quad 2 \times 3$ result 2×3

$$= \begin{bmatrix} 5(-2) + -3(4) & 5(9) + -3(-6) & 5(1) + -3(3) \\ 2(-2) + 8(4) & 2(9) + 8(-6) & 2(1) + 8(3) \end{bmatrix}$$

$$= \begin{bmatrix} -22 & 63 & -4 \\ 28 & -30 & 26 \end{bmatrix}$$

11. Solve the following system using the following methods: $\begin{aligned} -3x + 10y &= 5 \\ 2x + 7y &= 24 \end{aligned}$

a. Cramer's Rule

$$\text{Det} = \begin{vmatrix} -3 & 10 \\ 2 & 7 \end{vmatrix} = -3(7) - 2(10) = -21 - 20 = -41$$

$$X = \frac{\begin{vmatrix} 5 & 10 \\ 24 & 7 \end{vmatrix}}{-41} = \frac{35 - 240}{-41} = \frac{-205}{-41} = \boxed{5} \quad x = 5$$

$$Y = \frac{\begin{vmatrix} -3 & 5 \\ 2 & 24 \end{vmatrix}}{-41} = \frac{-3(24) - 5(2)}{-41} = \frac{-72 - 10}{-41} = \frac{-82}{-41} = \boxed{+2} \quad y = +2$$

$(5, +2)$

b. Augmented Matrix with Row Operations

$$-\frac{1}{3}R_1 \quad \left[\begin{array}{cc|c} -3 & 10 & 5 \\ 2 & 7 & 24 \end{array}\right]$$

$$-2R_1 + R_2 \to R_2 \quad \left[\begin{array}{cc|c} 1 & -\frac{10}{3} & -\frac{5}{3} \\ 2 & 7 & 24 \end{array}\right]$$

$$\frac{3}{41}R_2 \to R_2 \quad \left[\begin{array}{cc|c} 1 & -\frac{10}{3} & -\frac{5}{3} \\ 0 & \frac{41}{3} & \frac{82}{3} \end{array}\right]$$

$$\frac{10}{3}R_2 + R_1 \to R_1 \quad \left[\begin{array}{cc|c} 1 & -\frac{10}{3} & -\frac{5}{3} \\ 0 & 1 & 2 \end{array}\right] = \left[\begin{array}{cc|c} 1 & 0 & 5 \\ 0 & 1 & 2 \end{array}\right] \begin{array}{l} x = 5 \\ y = 2 \end{array}$$

$\boxed{(5, 2)}$

c. Matrix Equations

$$\begin{bmatrix} -3 & 10 \\ 2 & 7 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 5 \\ 24 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{\begin{vmatrix} -3 & 10 \\ 2 & 7 \end{vmatrix}} \cdot \begin{bmatrix} 7 & -10 \\ -2 & -3 \end{bmatrix} \begin{bmatrix} 5 \\ 24 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{-21 - 20} \cdot \begin{bmatrix} 7(5) + (-10)24 \\ -2(5) + -3(24) \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{-41} \cdot \begin{bmatrix} -205 \\ -82 \end{bmatrix} \qquad \boxed{(5, 2)}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 5 \\ 2 \end{bmatrix}$$

Unit 3

12. Find the center and radius of $(x-5)^2+(y+2)^2=25$.

Center: $(5,-2)$

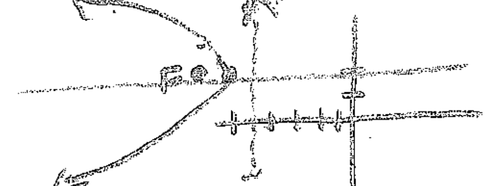
$r=5$

13. Find the vertex, focus and directrix of the parabola $(y-2)^2=-2(x+5)$.

$(y-2)^2=-2(x+5)$

Focus: $(-5-\frac{1}{2}, 2) = (-5\frac{1}{2}, 2)$

Vertex: $(-5,2)$



Focus: $\frac{4p}{4}=\frac{-2}{4}$ $\boxed{p=-\frac{1}{2}}$ opens left

Directrix: $-5+\frac{1}{2}$ $(-4\frac{1}{2})$ Axis of Sy: $y=2$

14. Given the ellipse $25x^2+4y^2=100$, find:

a. Center $(0,0)$

b. Vertices $(0,5)(0,-5)(2,0)(-2,0)$

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

$c=\sqrt{25-4}=\sqrt{21}$

d. Eccentricity

$e=\frac{c}{a}=\boxed{\frac{\sqrt{21}}{5}}$

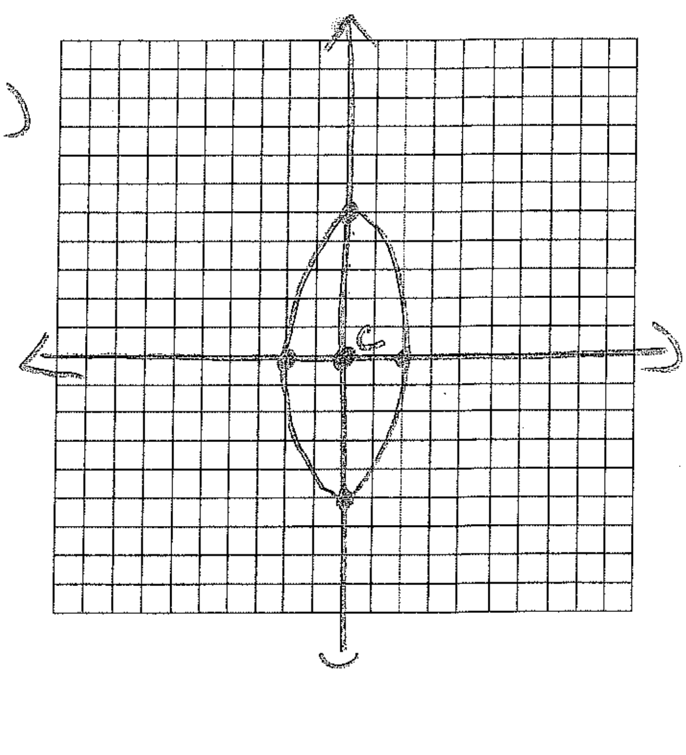
e. Major axis

10

f. Minor axis

4

g. Graph



$\frac{25x^2}{100}+\frac{4y^2}{100}=\frac{100}{100}$

$\frac{x^2}{4}+\frac{y^2}{25}=1$

2 5

15. Write the equation of the hyperbola $9x^2 - 4y^2 - 54x - 40y - 55 = 0$ in standard form and find the following:

$9x^2 - 54x \quad -4y^2 - 40y = 55$

$9(x^2 - 6x + \boxed{9}) - 4(y^2 + 10y + \boxed{25}) = 55 + \boxed{81} + \boxed{-100}$

$\dfrac{9(x-3)^2}{36} - \dfrac{4(y+5)^2}{36} = \dfrac{36}{36}$

$\boxed{\dfrac{(x-3)^2}{4} - \dfrac{(y+5)^2}{9} = 1}$

$(x-h)^2$

$9(x^2-6x)$

$y-k^2$

$-4y^2 - 40y$

$-4(y^2+10y$

a. Center $(3, -5)$

b. Vertices $(1, -5)(5, -5)$

c. Foci $c = \sqrt{a^2+b^2}$

$c = \sqrt{4+9} = \sqrt{13}$

$(3 \pm \sqrt{13}, -5)$

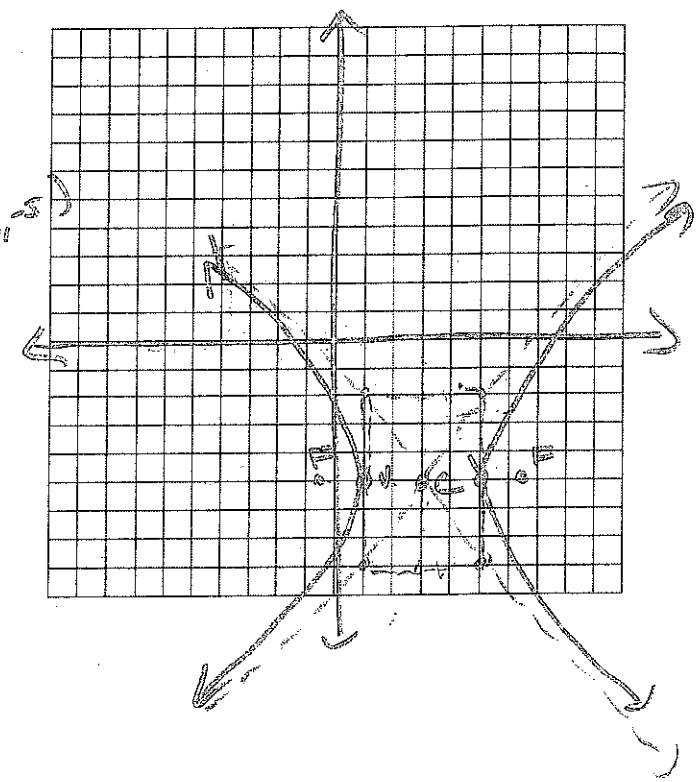
d. Eccentricity $e = \frac{c}{a} = \boxed{\frac{\sqrt{13}}{2}}$

e. Asymptotes

$y - k = \pm \frac{b}{a}(x-h)$

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

f. Graph



Unit 4

16. Find the reference angle for each of the following:

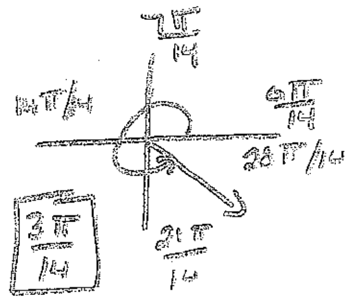
a. $-400°$

$-400 + 360 = -40$

$-40 + 360 = 320$

$360 - 320 = \boxed{40°}$

b. $\dfrac{25\pi}{14}$



$\dfrac{28\pi}{14} - \dfrac{25\pi}{14} = \boxed{\dfrac{3\pi}{14}}$

17. Convert $-\dfrac{\pi}{15}$ to degrees.

$\dfrac{-\pi}{15} \cdot \dfrac{180}{\pi} = \boxed{-12°}$

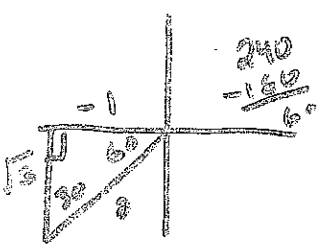
18. Convert $300°$ to radians.

$300 \cdot \dfrac{\pi}{180} = \boxed{\dfrac{5\pi}{3}}$

19. Find the exact value of:

a. $\sin 240°$

$240 - 180 = 60°$

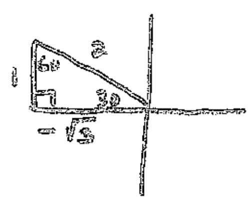


$\sin 240 = \boxed{\dfrac{-\sqrt{3}}{2}}$

b. $\cot 510°$

$510 - 360 = 150$

$\cot 150$



$= \dfrac{\cos}{\sin}$

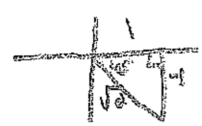
$= \dfrac{\frac{-\sqrt{3}}{2}}{\frac{1}{2}}$

$= \dfrac{-\sqrt{3}}{2} \cdot \dfrac{2}{1} = \boxed{-\sqrt{3}}$

c. $\sec\left(-\dfrac{\pi}{4}\right)$

$\sec\left(-\frac{180}{4}\right) =$

$\sec(-45) = \dfrac{H}{A} = \dfrac{\sqrt{2}}{1}$

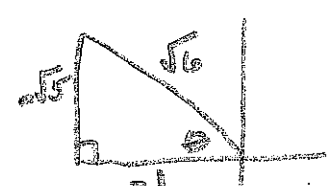


$\boxed{= \sqrt{2}}$

20. If $\tan\theta = -\sqrt{5}$ and the terminal side of the angle lies in Quadrant II, find each value:

a. $\sin\theta = \dfrac{\sqrt{5}}{\sqrt{6}} \cdot \dfrac{\sqrt{6}}{\sqrt{6}} = \boxed{\dfrac{\sqrt{30}}{6}}$

d. $\sec\theta = \boxed{\dfrac{1}{\frac{-\sqrt{6}}{6}}}$



b. $\cos\theta = \dfrac{-1}{\sqrt{6}} \cdot \dfrac{\sqrt{6}}{\sqrt{6}} = \boxed{\dfrac{-\sqrt{6}}{6}}$

e. $\csc\theta = \boxed{\dfrac{1}{\frac{\sqrt{30}}{6}}}$

$(\sqrt{5})^2 + (-1)^2 = x^2$

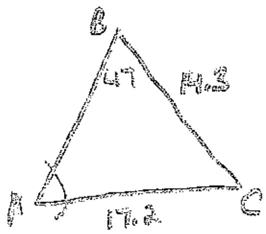
$5 + 1 = x^2$

$6 = x^2$

c. $\cot\theta = \dfrac{\cos}{\sin} = \dfrac{\frac{-6}{\sqrt{6}}}{\frac{\sqrt{30}}{}} = \dfrac{-6}{\sqrt{6}} \cdot \dfrac{6}{\sqrt{30}}$

Unit 5

21. In ΔABC, $a = 14.3$ cm., $b = 17.2$ cm., and $m\angle B = 47°$. Find $m\angle A$.



$$\frac{a}{\sin A} = \frac{b}{\sin B}$$

$$\frac{14.3}{\sin A} = \frac{17.2}{\sin 47}$$

$$\frac{17.2 \cdot \sin A}{17.2} = \frac{14.3 \cdot \sin 47}{17.2}$$

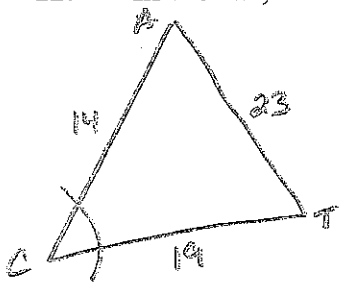
$\sin A = .6080446659$

$A = \sin^{-1}(.6080446659)$

$A = 37.44821017$

$\boxed{A = 37°}$

22. In ΔCAT, $c = 23$, $a = 19$, and $t = 14$. Find the measure of the largest angle.



$c^2 = a^2 + b^2 - 2ab\cos C$

$23^2 = \underbrace{(19)^2 + (14)^2}\, - 2(19)(14)\cos C$

$529 = 557 - 532\cos C$

$-557 \quad -557$

$\dfrac{-28}{-532} = \dfrac{-532\cos C}{-532}$

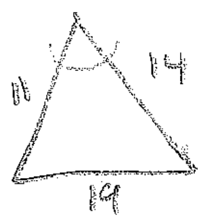
$\cos C = .0526315789$

$C = \cos^{-1}(\text{Ans})$

$C = 86.98305869$

$\boxed{C = 87°}$

23. Find the area of a triangle that has sides measuring 11, 14, and 19.



$19^2 = \underbrace{11^2 + 14^2} - 2(11)(14)\cos X$

$361 = 317 - 308\cos X$

$-317 \quad -317$

$\dfrac{44}{-308} = \dfrac{-308\cos X}{-308}$

$X = 98°$

$K = \frac{1}{2}ab\sin C$

$K = \frac{1}{2}(11)(14)\sin 98$

$K = 76.25064128$

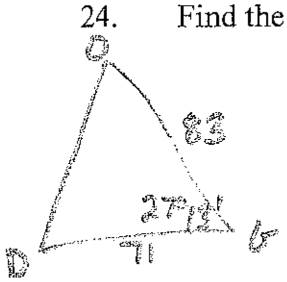
$\boxed{K = 76.25}$

or

$s = \frac{1}{2}(a+b+c)$

$K = \sqrt{s(s-a)(s-b)(s-c)}$

24. Find the area of ΔDOG if $d = 83$, $o = 71$, and $m\angle G = 27°13'$.



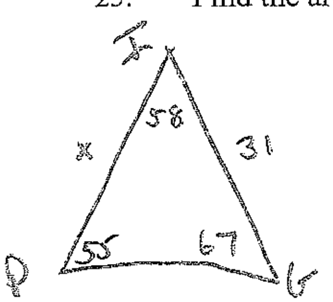
$K = \frac{1}{2}ab\sin C$

$K = \frac{1}{2}(83)(71)\sin 27°13'$

$K = 1347.601306$

$\boxed{K = 1347.6}$

25. Find the area of ΔPIG if $p = 31$, $m\angle I = 58°$ and $m\angle G = 67°$.



$$\frac{31}{\sin 55} = \frac{x}{\sin 67}$$

$$\frac{\sin 55\, x}{\sin 55} = \frac{31 \sin 67}{\sin 55}$$

$X = 34.83559645$

$x = 34.84$

$K = \frac{1}{2}ab\sin C$

$K = \frac{1}{2}(34.84)(31)\sin 58$

$K = 457.9050559$

$\boxed{K = 457.91}$

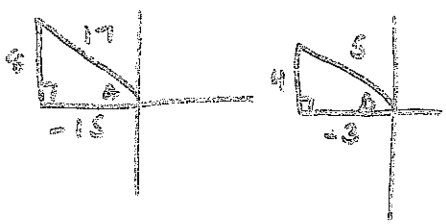
26. Verify: $\sec\theta\csc\theta = \dfrac{\cos\theta}{\sin\theta} + \dfrac{\sin\theta}{\cos\theta}$

$$\frac{1}{\cos\theta}\cdot\frac{1}{\sin\theta} \;\Big|\; \frac{\cos^2\theta}{\cos\theta\sin\theta} + \frac{\sin^2\theta}{\cos\theta\sin\theta}$$

$$\frac{1}{\cos\theta\sin\theta} \;\Big|\; \frac{\cos^2\theta + \sin^2\theta}{\cos\theta\sin\theta}$$

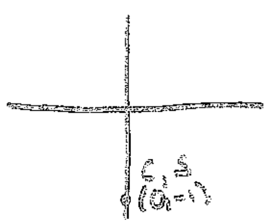
$$\frac{1}{\cos\theta\sin\theta} \;\Big|\; \frac{1}{\cos\theta\sin\theta}$$

27. If A and B are both in quadrant II, $\csc A = \dfrac{17}{8}$ and $\sec B = -\dfrac{5}{3}$, find the *exact* value of $\cos(A - B)$.



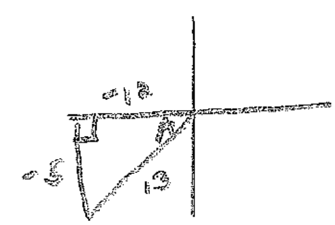
$$\cos(A-B) = \cos A\cos B + \sin A\sin B$$
$$= \frac{-15}{17}\cdot\frac{-3}{5} + \frac{8}{17}\cdot\frac{4}{5}$$
$$= \frac{45}{85} + \frac{32}{85} = \boxed{\frac{77}{85}}$$

28. Evaluate: $\sin(x + 270°)$



$$\sin(x+270) = \sin x\cos 270 + \cos x\sin 270$$
$$= \sin x\cdot(0) + \cos x(-1)$$
$$= 0 + -\cos x$$
$$\boxed{= -\cos x}$$

29. If $\tan A = \dfrac{5}{12}$ and A is in the third quadrant, find the *exact* value of:



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

b. $\cos 2A = \cos^2 A - \sin^2 A$
$= \left(\frac{-12}{13}\right)^2 - \left(\frac{-5}{13}\right)^2 = \frac{144}{169} - \frac{25}{169} = \boxed{\frac{119}{169}}$

c. $\tan 2A = \dfrac{2\tan A}{1-\tan^2 A} = \dfrac{2\left(\frac{5}{12}\right)}{1-\left(\frac{5}{12}\right)^2} = \dfrac{\frac{10}{12}}{1-\frac{25}{144}} = \dfrac{\frac{10}{12}}{\frac{119}{144}} = \dfrac{10}{12}\cdot\dfrac{144}{119} = \boxed{\dfrac{120}{119}}$

$\frac{S \mid A}{T \mid C}$

30. Solve $2\cos^2\theta - \cos\theta = 0$ for all values of x in the interval $\underline{0 \le \theta < 360°}$

$\cos\theta(2\cos\theta - 1) = 0$

$(0,1)$ $(-1,0)$ $(1,0)$ $(0,-1)$

$\cos\theta = 0$	$2\cos\theta - 1 = 0$
$\theta = 90°, 270°$	$\frac{2\cos\theta}{2} = \frac{1}{2}$
	$\cos\theta = \frac{1}{2}$ $\oplus$
	$\theta = 60°$

I : $60°$

IV : $360 - 60 = 300°$

$\boxed{\theta = 60°, 90°, 270°, 300°}$

31. Solve $\sin^2\theta - 2\sin\theta = 3$ for all values of x in the interval $0 \le \theta < 360°$, rounding answers to the *nearest degree*.

$\sin^2\theta - 2\sin\theta - 3 = 0$

$(\sin\theta + 1)(\sin\theta - 3) = 0$

$\sin\theta + 1 = 0$	$\sin\theta - 3 = 0$
$\sin\theta = -1$	$\sin\theta = 3$
$\boxed{\theta = 270}$	Error

Unit 7

32. Given the points $A(-2,7)$ and $B(4,5)$,

a. Write $\overline{AB}$ as an ordered pair.

$\overrightarrow{AB} = \langle x_2 - x_1, y_2 - y_1 \rangle$

$\overrightarrow{AB} = \langle 4-(-2), 5-7 \rangle$

$\boxed{\overrightarrow{AB} = \langle 6, -2 \rangle}$

b. Find the magnitude of $\overline{AB}$.

$|\overrightarrow{AB}| = \sqrt{x^2+y^2}$

$= \sqrt{6^2+(-2)^2}$

$= \sqrt{36+4} = \boxed{\sqrt{40}}$

c. Write $\overline{AB}$ as the sum of unit vectors.

$\boxed{6\vec{i} - 2\vec{j}}$

33. If $\bar{c} = 2\bar{a} - 3\bar{b}$, find $\bar{c}$ if $\bar{a} = \langle -1, 4 \rangle$ and $\bar{b} = \langle -3, -5 \rangle$.

$\vec{c} = 2\langle -1, 4 \rangle - 3\langle -3, -5 \rangle$

$\vec{c} = \langle -2, 8 \rangle + \langle 9, +15 \rangle$

$\boxed{\vec{c} = \langle 7, 23 \rangle}$

34. Find the inner product of $\langle -2,8 \rangle$ and $\langle 12,3 \rangle$. Are the vectors perpendicular?

$= -2(12) + 8(3)$

$= -24 + 24 = 0$ ✓

Yes, the vectors are $\perp$.

35. Write $2x - 7y = 11$ in parametric form.

$\frac{-7y}{-7} = \frac{-2x}{-7} + \frac{11}{-7}$

$y = \frac{2}{7}x - \frac{11}{7}$

$x = t$

$\boxed{y = \frac{2}{7}t - \frac{11}{7}}$

36. Given the parametric equation $x = 5t + 3$ and $y = -2t - 1$, rewrite the equation in slope-intercept form.

$\frac{x-3}{5} = \frac{5t}{5}$

$t = \frac{x-3}{5}$

$\frac{y+1}{-2} = \frac{-2t}{-2}$

$t = \frac{y+1}{-2}$

$\frac{x-3}{5} = \frac{y+1}{-2}$

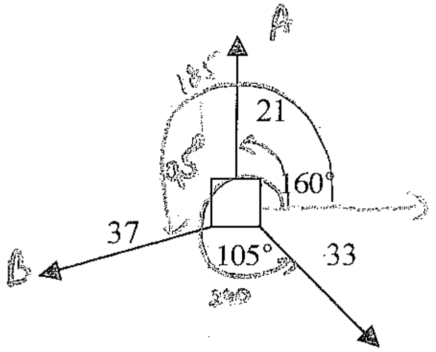
$-2(x-3) = 5(y+1)$

$-2x + 6 = 5y + 5$

$\frac{5y}{5} = \frac{-2x}{5} + \frac{1}{5}$

$\boxed{y = \frac{-2}{5}x + \frac{1}{5}}$

37. Find the magnitude and direction of the resultant.



$A_x: 21 \cdot \cos 90 = 0$

$A_y: 21 \cdot \sin 90 = 21$

$B_x: 37 \cdot \cos 185 = -36.8592 0383$

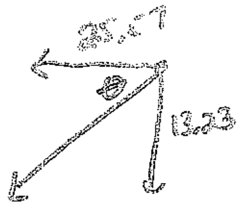
$B_y: 37 \sin 185 = -3.224 76 2482$

$C_x: 33 \cos 290 = 11.2866473$

$C_y: 33 \sin 290 = -31.00985 644$

$\sum F_x: 0 + (-36.86) + 11.29 = \boxed{-25.57}$

$\sum F_y: 21 + (-3.22) + (-31.01) = \boxed{-13.23}$



Mag: $\sqrt{x^2 + y^2}$

$= \sqrt{(25.57)^2 + (13.23)^2}$

$\boxed{= 28.79}$

$\theta = \tan^{-1}(13.23 / 25.57) = 27.36°$

$\boxed{27.36° \text{ S of W}}$

38. Josh comes up to bat with two outs in the bottom of the ninth inning. The pitcher throws the ball and Josh swings when the ball is approximately 3.5 feet above the ground. He hits the ball with an initial velocity of 130 feet per second at an angle of 25° above the horizontal. The ball travels directly towards the center field wall, which is 10 feet high and 380 feet away. Will the ball clear the fence for a homerun, or will the center fielder be able to catch it?

$X = t \cdot v \cdot \cos\theta$

$\boxed{X = 130 t \cos 25}$

$y = t \cdot v \cdot \sin\theta - 16t^2 + h_0$

$\boxed{y = 130 t \sin 25 - 16t^2 + 3.5}$

$\frac{380}{130 \cos 25} = \frac{130 t \cos 25}{130 \cos 25}$

$t = 3.225258552$

$t = 3.23$ secs

Fence is 10 ft high

$y = 130(3.23)\sin 25 - 16(3.23)^2 + 3.5$

$y = 14.0310081$ ft

$\therefore$ Yes, the ball will clear the fence (HR) !!

6) ① $x + 2y + 3z = 5$

② $3x + 2y - 2z = -13$

③ $5x + 3y - z = -11$

① $x + 2y + 3z = 5$

② $-1(3x + 2y - 2z = -13)$

$x + \cancel{2y} + 3z = 5$

$-3x \cancel{-2y} + 2z = 13$

④ $-2x + 5z = 18$

② $3(3x + 2y - 2z = -13)$

③ $-2(5x + 3y - z = -11)$

$9x + \cancel{6y} - 6z = -39$

$-10x \cancel{-6y} + 2z = 22$

⑤ $-x - 4z = -17$

④ $(-2x + 5z = 18)$

⑤ $-2(-x - 4z = -17)$

$= \quad \cancel{-2x} + 5z = 18$

$\cancel{2x} + 8z = 34$

$\frac{13z}{13} = \frac{52}{13}$

$\boxed{z = 4}$

④ $-2x + 5(4) = 18$

$-2x + 20 = 18$

$-20 \quad -20$

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

$\boxed{x = 1}$

① $1 + 2y + 3(4) = 5$

$1 + 2y + 12 = 5$

$2y + 13 = 5$

$-13 \quad -13$

$\frac{2y}{2} = \frac{-8}{2}$

$\boxed{y = -4}$

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