Homework Assignments

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Exam IV Review

Review Exam I

1 a) Find the radian measure of $60°, 120°, 180°, 240°, 300°, 360°$

b) Find the degree measure of $\frac{\pi}{6}, \frac{\pi}{3}, \frac{\pi}{2}, \frac{2\pi}{3}, \frac{5\pi}{6}, \pi$

2. Name the quadrant that the terminal side of the angle lies (in standard position): a) 6.3 b) $\frac{8\pi}{3}$ c) $-\frac{7\pi}{6}$ d) 1830°

3. Find the exact values of the other 5 trigonometric functions of θ if $\cos\theta = \frac{2\sqrt{2}}{3}$ and θ is acute.

4. Find the exact value without a calculator

a) $2\sin 45° + 4\cos 30°$

b) $4 + \tan^2 \frac{\pi}{3}$

5. Find the exact values of the other 5 trigonometric functions of θ if $\sin\theta = -\frac{2}{3}$, $180° < \theta < 270°$

6. Find exact values without a calculator

a) $\sin 180°$ b) $\cos(-\frac{\pi}{6})$ c) $\cos\frac{11\pi}{6}$ d) $\tan\frac{7\pi}{6}$

e) $\sec\frac{2\pi}{3}$ f) $\cos(-\frac{5\pi}{4})$ g) $\csc(-\frac{3\pi}{2})$

7. Solve $\cos x = 1$, $-2\pi \le x \le 2\pi$.

8. For what values x, $-2\pi \le x < 2\pi$ does $y = \tan x$ have a vertical asymptote?

9. Graph $y = \cot x$, $-2\pi \le x \le 2\pi$

10. Find amplitude, period and phase shift and graph $y = 2\cos(2\pi x + \pi)$ for $-2 \le x \le 2$

Solution Review Exam I

1 a) $\frac{\pi}{3}, \frac{2\pi}{3}, \pi, \frac{4\pi}{3}, \frac{5\pi}{3}, 2\pi$

b) $30°, 60°, 90°, 120°, 150°, 180°$

2 a) I, b) II, c) II, d) I

3. $\sin\theta = \frac{1}{3}$ $\tan\theta = \frac{\sqrt{2}}{4}$ $\csc\theta = 3$ $\sec\theta = \frac{3\sqrt{2}}{4}$ $\cot\theta = 2\sqrt{2}$

4 a) $\sqrt{2} + 2\sqrt{3}$ b) 7

5. $\cos\theta = -\frac{\sqrt{5}}{3}$ $\tan\theta = \frac{2\sqrt{5}}{5}$ $\csc\theta = -\frac{3}{2}$ $\sec\theta = -\frac{3\sqrt{5}}{5}$

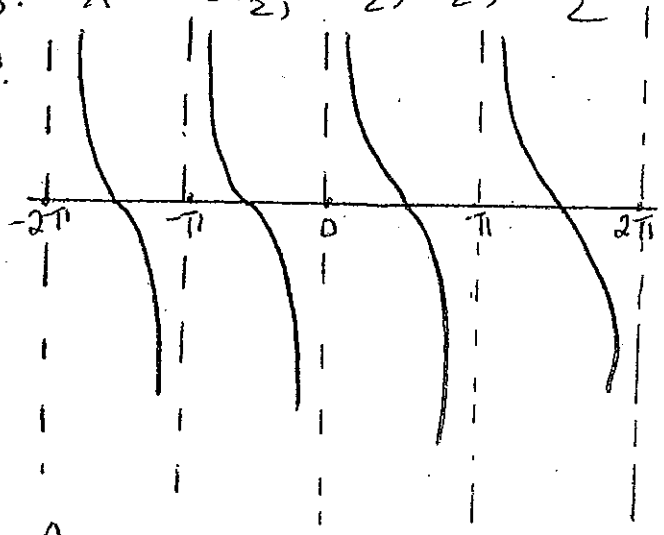
$\cot\theta = \frac{\sqrt{5}}{2}$

6. a) 0 b) $\frac{\sqrt{3}}{2}$ c) $\frac{\sqrt{3}}{2}$ d) $\frac{\sqrt{3}}{3}$ e) -2 f) $-\frac{\sqrt{2}}{2}$ g) 1

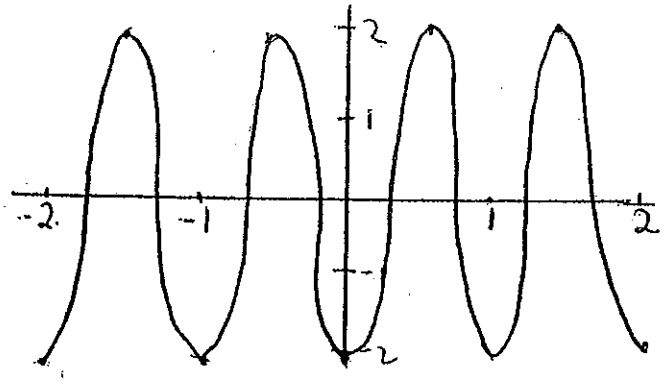
7. $X = -2\pi, 0, 2\pi$

8. $X = -\frac{3\pi}{2}, -\frac{\pi}{2}, \frac{\pi}{2}, \frac{3\pi}{2}$

9.



10. Amplitude = 2 Period = 1 Phase Shift = $-\frac{1}{2}$



Review Exam II

1. Find the exact values of

a) $\tan^{-1}(-\sqrt{3})$ b) $\sin^{-1}(-\frac{1}{2})$ c) $\cos^{-1}(-\frac{1}{2})$

d) $\cot(\cos^{-1}(-\frac{\sqrt{3}}{2}))$

2. Prove $\frac{\tan\theta - \cot\theta}{\tan\theta + \cot\theta} + 2\cos^2\theta = 1$

3. Find the exact value of $\cos[\tan^{-1}\frac{5}{12} - \sin^{-1}(-\frac{3}{5})]$

4. Without a calculator, find $\sin\frac{\pi}{12}$

5. Find the exact value of

a) $\sin(\alpha+\beta)$ b) $\cos(\alpha+\beta)$ c) $\sin(\alpha-\beta)$

d) $\tan(\alpha-\beta)$ for $\cos\alpha = \frac{\sqrt{5}}{5}$, $0<\alpha<\frac{\pi}{2}$; $\sin\beta = -\frac{4}{5}$

$-\frac{\pi}{2} < \beta < 0$

6. Find the exact values, without a calculator of $\sin 2x$, $\cos 2x$, $\tan 2x$ if $\sin x = \frac{3}{5}$, $0<x<\frac{\pi}{2}$

7. Find the exact values of $\sin\frac{x}{2}$, $\cos\frac{x}{2}$, $\tan\frac{x}{2}$, if $\sin x = -\frac{4}{5}$, $\pi < x < \frac{3\pi}{2}$

8. Use a half angle formula to find the exact value of $\tan\frac{7\pi}{12}$

9. Solve the following equations ($0 \le \theta < 2\pi$)

a) $\sin\theta = -\frac{1}{2}$

b) $\sin 2\theta = \sin\theta$

c) $\cot 2\theta = -\sqrt{3}$

d) $2\sin^2\theta = 3\sin\theta - 1$

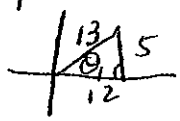
Solution Review Exam II

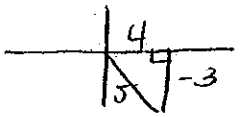
1. a) $-\frac{\pi}{3}$ b) $-\frac{\pi}{6}$ c) $\frac{2\pi}{3}$ d) $-\sqrt{3}$

2. $\dfrac{\tan\theta-\cot\theta}{\tan\theta+\cot\theta}+2\cos^2\theta = \dfrac{\frac{\sin\theta}{\cos\theta}-\frac{\cos\theta}{\sin\theta}}{\frac{\sin\theta}{\cos\theta}+\frac{\cos\theta}{\sin\theta}}+2\cos^2\theta$

$= \dfrac{\frac{\sin^2\theta-\cos^2\theta}{\sin\theta\cos\theta}}{\frac{\sin^2\theta+\cos^2\theta}{\sin\theta\cos\theta}}+2\cos^2\theta = \sin^2\theta-\cos^2\theta+2\cos^2\theta = \sin^2\theta+\cos^2\theta = 1$

3. $\theta_1 = \tan^{-1}\left(\frac{5}{12}\right)$ $\theta_2 = \sin^{-1}\left(-\frac{3}{5}\right)$





$\cos(\theta_1-\theta_2) = \cos\theta_1\cos\theta_2+\sin\theta_1\sin\theta_2 = \frac{12}{13}\left(\frac{4}{5}\right)+\frac{5}{13}\left(\frac{-3}{5}\right) = \frac{33}{65}$

4 $\sin\frac{\pi}{12} = \sin\left(\frac{4\pi}{12}-\frac{3\pi}{12}\right) = \sin\left(\frac{\pi}{3}-\frac{\pi}{4}\right) = \sin\frac{\pi}{3}\cos\frac{\pi}{4}-\cos\frac{\pi}{3}\sin\frac{\pi}{4}$

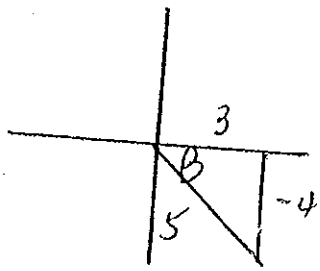
$= \frac{\sqrt{6}-\sqrt{2}}{4}$

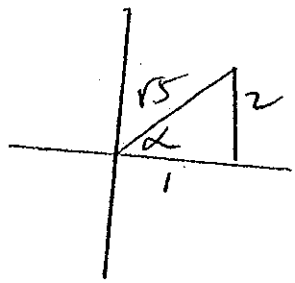
5 a) $\sin(\alpha+\beta) = \frac{2\sqrt{5}}{25}$

b) $\cos(\alpha+\beta) = \frac{11\sqrt{5}}{25}$

c) $\sin(\alpha-\beta) = \frac{2\sqrt{5}}{5}$

d) $\tan(\alpha-\beta) = -2$





6. $\sin 2x = \frac{24}{25}$; $\cos 2x = \frac{7}{25}$; $\tan 2x = \frac{24}{7}$

7. $\sin\frac{x}{2} = +\sqrt{\frac{1-(-3/5)}{2}} = +\sqrt{\frac{5+3}{10}} = \frac{4\sqrt{5}}{10} = \frac{2\sqrt{5}}{5}$

NOTE: $\frac{\pi}{2} < \frac{x}{2} < \frac{3\pi}{4}$ (Quad II)

$\cos\frac{x}{2} = -\sqrt{\frac{1+(-3/5)}{2}} = -\sqrt{\frac{2}{10}} = -\frac{\sqrt{5}}{5}$

$\tan\frac{x}{2} = -\sqrt{\frac{1-(-3/5)}{1+(-3/5)}} = -\sqrt{\frac{8}{2}} = -2$

8. $\tan \frac{7\pi}{12} = -\sqrt{\frac{1-\cos\frac{7\pi}{6}}{1+\cos\frac{7\pi}{6}}} = -\sqrt{\frac{1-(-\frac{\sqrt{3}}{2})}{1+(-\frac{\sqrt{3}}{2})}} = -\sqrt{\frac{2+\sqrt{3}}{2-\sqrt{3}}}$

9. a) $\theta = \frac{7\pi}{6}, \frac{11\pi}{6}$ b) $\theta = 0, \frac{\pi}{3}, \pi, \frac{5\pi}{3}$

c) $2\theta = \frac{5\pi}{6}, \frac{11\pi}{6}, \frac{17\pi}{6}, \frac{23\pi}{6}$ so $\theta = \frac{5\pi}{12}, \frac{11\pi}{12}, \frac{17\pi}{12}, \frac{23\pi}{12}$

d) $\theta = \frac{\pi}{6}, \frac{5\pi}{6}, \frac{\pi}{2}$

Review Exam III

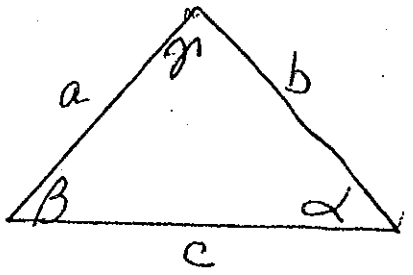
1. Solve the triangle where

a) $\alpha = 41°$, $\beta = 77°$, $c = 10.0$

b) $\alpha = 38°$, $a = 1.95$, $b = 2.43$, β obtuse

c) $\beta = 57°$, $a = 6.0$, $b = 5.0$

d) $a = 6.00$ $b = 5.00$ $c = 5.50$



2. What are the rectangular coordinates of a point with the following polar coordinates (leave radicals in answers)

a) $(5, \frac{5\pi}{6})$ b) $(3, \frac{\pi}{2})$ c) $(4, \frac{5\pi}{6})$

3. What are the polar coordinates of a point with rectangular coordinates

a) $(3\sqrt{2}, -3\sqrt{2})$ b) $(-\sqrt{3}, 1)$ (Leave answers with radicals or π)

4. Give 3 other pairs of polar coordinates (r, θ) equivalent to $(2, \frac{\pi}{6})$ where $-2\pi \leq \theta \leq 2\pi$

5. Change the following polar equations to rectangular form:

a) $r = \sin\theta - \cos\theta$ b) $r^2 = 2\sin\theta$

6. Change the following rectangular equations to polar form:

a) $2x + 5y = 8$ b) $x^2 + y^2 - 2x = 16$

7. Sketch the following polar graphs (Include 3 polar points on each graph.)

a) $r = 10\cos\theta$

b) $r = 2 + 2\sin\theta$

c) $r = 5$

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

8. Write each expression in the standard form $a + bi$

a) $\frac{13}{5 - 12i}$ b) i^{14} c) $2i^4(1 + i^2)$

9. Solve $10x^2+6x+1=0$ in the complex number system.

10. Write in rectangular form: $2\left(\cos\frac{5\pi}{6}+i\sin\frac{5\pi}{6}\right)$

11. For $z=\cos 120^\circ+i\sin 120^\circ$ $\quad w=\cos 100^\circ+i\sin 100^\circ$
    a) Find $z\cdot w$ $\quad$ b) Find $\frac{z}{w}$ (leave in polar form)

12. Write in standard form $a+bi$: $\left[\frac{1}{2}(\cos 72^\circ+i\sin 72^\circ)\right]^5$

13. Change to polar form, perform operation, then change back to standard form $a+bi$: $(\sqrt{3}-i)^6$

14. Find all complex cube roots and leave in polar form for $-8-8i$

Solution Review Exam III

1 a) $\gamma = 62°$, $a = 74$ $b = 110$

b) $\beta = 129.83°$, $\gamma = 12.17°$, $c = .668$

c) No solution

d) $\alpha = 69.5°$, $\beta = 51.33°$, $\gamma = 59.17°$

2 a) $\left(-\frac{5\sqrt{3}}{2}, \frac{5}{2}\right)$ b) $(0,3)$ c) $(-2\sqrt{3}, 2)$

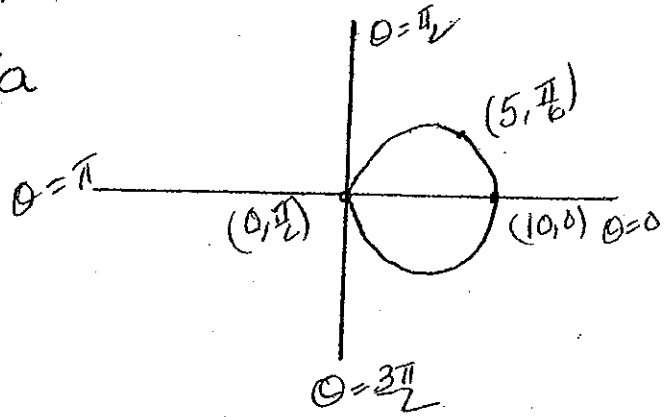
3 a) $\left(6, \frac{7\pi}{4}\right)$ b) $\left(2, \frac{5\pi}{6}\right)$

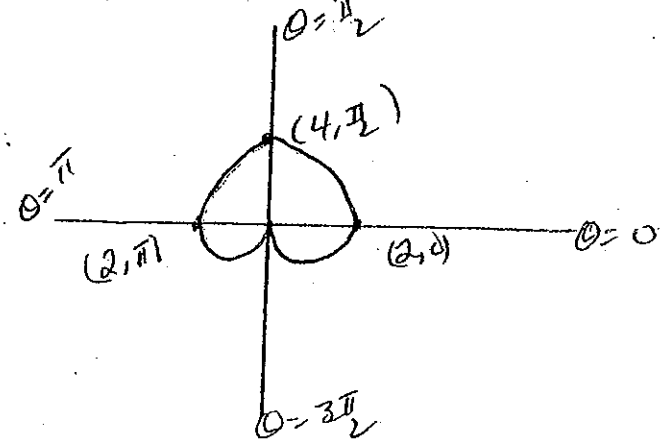
4 $\left(2, -\frac{7\pi}{4}\right)$ $\left(-2, -\frac{3\pi}{4}\right)$ $\left(-2, \frac{5\pi}{4}\right)$

5 a) $x^2+y^2+x-y=0$ b) $(x^2+y^2)^{3/2} = 2y$

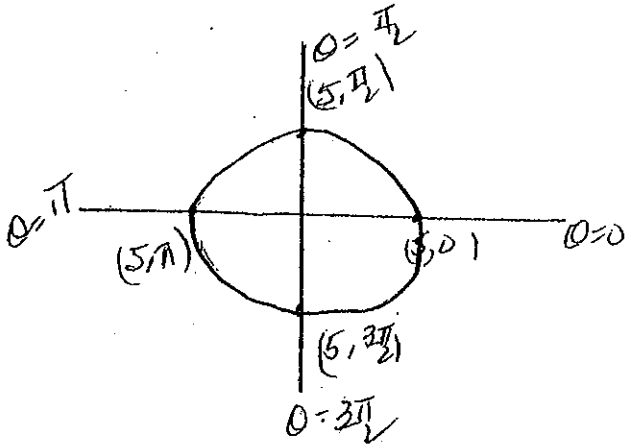
6 a) $2r\cos\theta + 5r\sin\theta = 8$ b) $r^2 - 2r\cos\theta = 16$

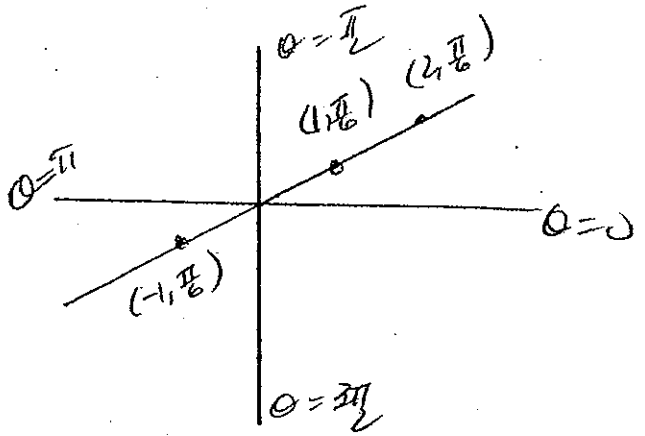
7a





c)





8 a) $\frac{5}{13} + \frac{12}{13}i$ b) -1 c) 0

9. $\left\{-\frac{3}{10} + \frac{1}{10}i, -\frac{3}{10} - \frac{1}{10}i\right\}$

10. $-\sqrt{3} + i$

11. a) $zw = \cos 220^\circ + i \sin 220^\circ$

b) $\frac{z}{w} = \cos 20^\circ + i \sin 20^\circ$

12. $\frac{1}{32}$

13. -64

14. $z_0 = 2\sqrt{2}\,(\cos 75^\circ + i \sin 75^\circ)$

$z_1 = 2\sqrt{2}\,(\cos 195^\circ + i \sin 195^\circ)$

$z_2 = 2\sqrt{2}\,(\cos 315^\circ + i \sin 315^\circ)$

Review Exam IV

1. Write $V = \overrightarrow{PQ}$ in the form $ai + bj$ where $P = (-3, 2)$ $Q = (6, 5)$

2. Find $\|V\|$ where $V = -5i + 12j$

3. Find a unit vector having the same direction as $V = 2i - j$

4. What is the equation of a parabola with focus at $(\frac{3}{2}, 0)$ and directrix $x = -\frac{3}{2}$?

5. What is the equation of a parabola with focus at $(0, 2)$ and directrix $y = -2$?

6. Sketch the graph of $y^2 = -8x$. Label focus, directrix vertex, points on latus rectum.

7. Sketch the graph of $4x^2 + 16y^2 = 16$. Label foci and intercepts.

8. Sketch the graph of $x^2 - 36y^2 = 36$. Label vertices, asymptotes, asymptote rectangle and foci

9. Determine if graph is a parabola, ellipse or hyperbola.

   For parabola: sketch, including vertex, focus, directrix, and points on latus rectum

   For ellipse: sketch, including vertices, foci and center

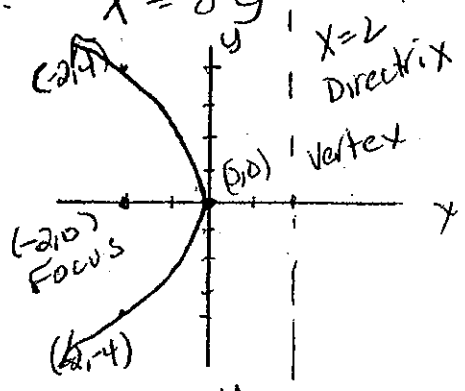
   For hyperbola: sketch, including vertices, foci, asymptote rectangle, equations of asymptotes and center

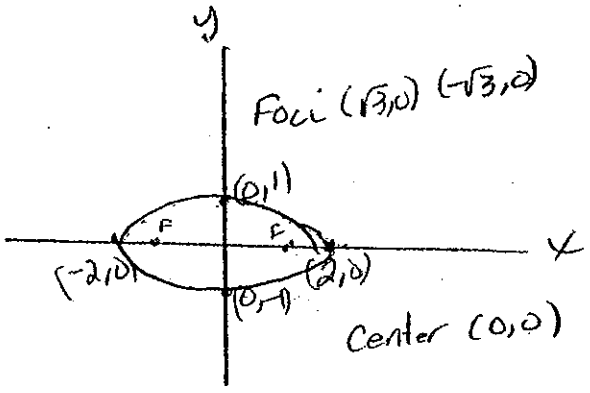
   a) $4x^2 + 24x + 9y^2 - 36y + 36 = 0$

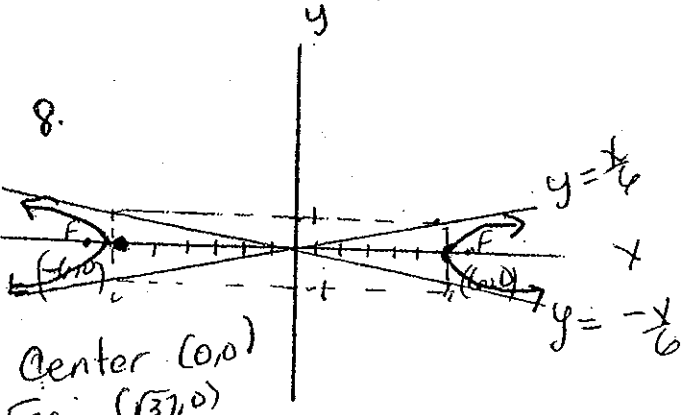
   b) $9x^2 - 4y^2 + 72x + 24y + 144 = 0$

   c) $y^2 + 3x + 12y + 42 = 0$

Solution Review Exam IV

1. $V = 9i + 3j$
2. $\|v\| = 13$
3. $u = \frac{2\sqrt{5}}{5}i - \frac{\sqrt{5}}{5}j$
4. $y^2 = 6x$
5. $x^2 = 8y$
6. 

7. 

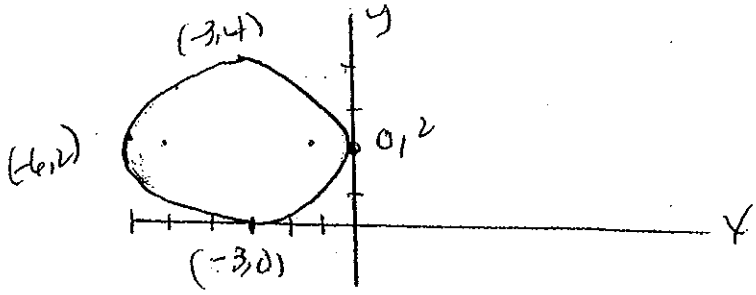
8. 

Center (0,0)
Foci $(\sqrt{37},0)$
$(-\sqrt{37},0)$

9a $\frac{(x+3)^2}{9} + \frac{(y-2)^2}{4} = 1$ Ellipse

Center $(-3,2)$ $a=3$ $b=2$

Foci $(-3-\sqrt{5},2)$ $(-3+\sqrt{5},2)$



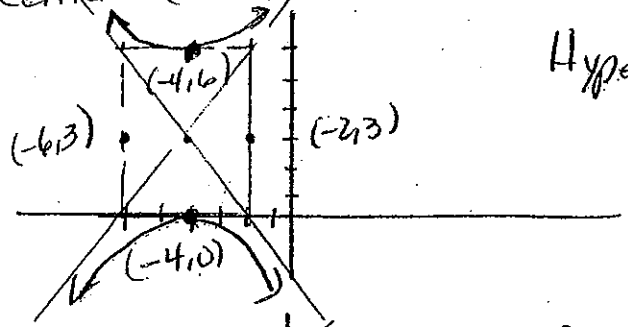
9b $\frac{(y-3)^2}{9} - \frac{(x+4)^2}{4} = 1$

Foci $(-4, 3+\sqrt{13})$ $(-4, 3-\sqrt{13})$

Asymptotes $y - 3 = \pm\frac{3}{2}(x+4)$

Center $(-4,3)$ $a=3$ $b=2$

Hyperbola



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

Vertex $(-2,-6)$ $a = -\frac{3}{4}$

Focus $(-\frac{11}{4}, -6)$

Directrix $x = -\frac{5}{4}$

Parabola