_____ / 47 total points (both parts)

Test #3 (Part 1, No Calculator) Name: _____

Math 160, Prof. Beydler Thursday, November 29, 2018

Directions: Show all work. No calculator, books, or notes. Your desk and lap must be clear (no phones, no smart watches, etc.). If you have a phone in your lap or on your chair, it is considered cheating, and you will receive a zero on this test. Write your answers in the indicated places, or box your answers. When you're finished with Part 1, please turn it in, take a bathroom break, get your calculator out, and start Part 2. Good luck!

1. (1 point) Are $\langle -2, -3\rangle$ and $\langle -6, 4\rangle$ orthogonal?

$(-2)(-6)+(-3)(4)=0$ (orthogonal) not orthogonal (circle one)

2. (4 points) Determine whether the equation represents a parabola, an ellipse, or a hyperbola. If the graph is a parabola, find the vertex, focus, directrix, and focal diameter. If it is an ellipse, find the center, foci, vertices, lengths of the major and minor axes, and eccentricity. If it is a hyperbola, find the center, foci, vertices, and asymptotes. Then sketch the graph of the equation. (Note: $\sqrt{2} \approx 1.4$ and $\sqrt{6} \approx 2.4$)

$4x^2 - 2y^2 = 8$ parabola ellipse (hyperbola) (circle one)

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

$\pm\sqrt{2}$ in x-dir. ± 2 in y-dir.

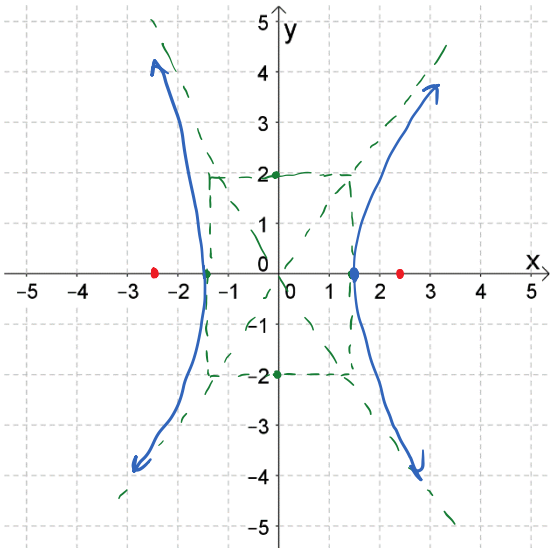
Center: $(0, 0)$

$c = \sqrt{2+4} = \sqrt{6}$

Foci: $(\pm\sqrt{6}, 0)$

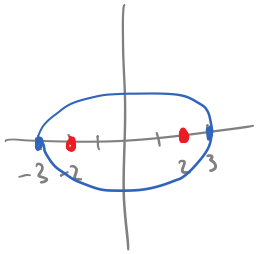
Vertices: $(\pm\sqrt{2}, 0)$

Asymptotes: $y = \pm\frac{2}{\sqrt{2}}x$



3. (2 points) Find an equation for the ellipse that satisfies the given conditions.

Foci: $(\pm 2, 0)$, vertices: $(\pm 3, 0)$



$\frac{x^2}{9} + \frac{y^2}{5} = 1$

3^2

Answer: $\frac{x^2}{9} + \frac{y^2}{5} = 1$

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

$2 = \sqrt{9 - b^2}$

$4 = 9 - b^2$

$b^2 = 5$

4. (4 points) Determine whether the equation represents a parabola, an ellipse, or a hyperbola. If the graph is a parabola, find the vertex, focus, directrix, and focal diameter. If it is an ellipse, find the center, foci, vertices, lengths of the major and minor axes, and eccentricity. If it is a hyperbola, find the center, foci, vertices, and asymptotes. Then sketch the graph of the equation.

$x^2 + 4x = 4y - 4$ (parabola) ellipse hyperbola (circle one)

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

$(x+2)^2 = 4y$

Vertex: $(-2, 0)$

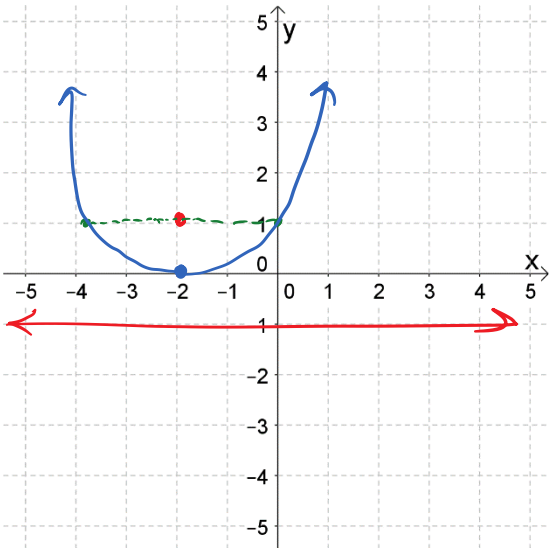
$4p = 4$

$p = 1$

Focus: $(-2, 1)$

Directrix: $y = -1$

Focal diameter: $|4p| = |4| = 4$



5. (3 points) Find all solutions to the system: $\begin{cases} x^2 - y^2 = 1 \\ 2x^2 - y^2 = x + 3 \end{cases}$

Answer: $(-1, 0)$, $(2, \sqrt{3})$, $(2, -\sqrt{3})$

$x^2 - y^2 = 1$

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

$-x^2 = -x - 2$

$x^2 - x - 2 = 0$

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

$x = -1$ $\quad$ $x = 2$

$(-1)^2 - y^2 = 1$ $\quad$ $(2)^2 - y^2 = 1$

$y^2 = 0$ $\quad$ $y^2 = 3$

$y = 0$ $\quad$ $y = \pm\sqrt{3}$