# Exam #4

November 20, 2017

Name _____

- You will be told when to begin the work and when to terminate work on the examination. You must stop when instructed. Points may be deducted in case of violations.

- Please show your work to support your answers that require calculations. Correct but unsupported answers may not be given full credit.

- The use of a cell phone or other electronic communication devices during the examination is not allowed. The exam will be canceled and a grade of "0" will be assigned to anyone who uses a cell phone during the examination or if one is found within hands reach.

- Calculators are not allowed on this exam.

- The exam consist of two parts. Part I contains four multiple choice questions worth 8 points each. Part II contains three open ended questions worth 26 points each if not stated otherwise.

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Part I

Choose your answer from five available choices. No partial credit will be given for wrong answers.

1. The equation $2x^2 - y^2 + 10x - y - 37 = 0$ describes which of the following?

   (a) Parabola
   (b) Ellipse
   (c) Straight line
   (d) Hyperbola
   (e) None of the above

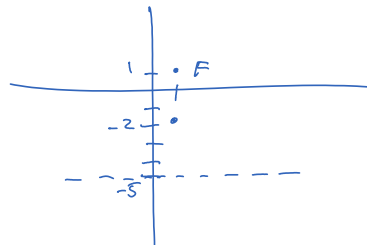2. Which of the following is the graph of the equation $\frac{x^2}{9} + \frac{y^2}{25} = 1$?

(a)

(b)

(c)

(d)
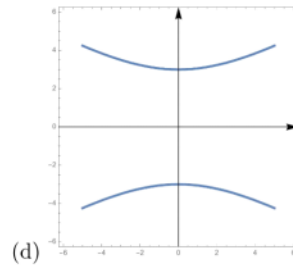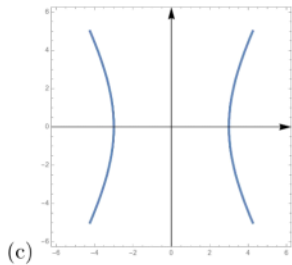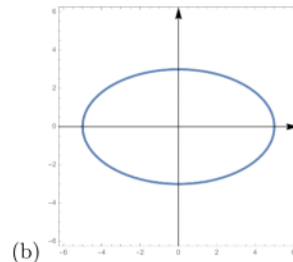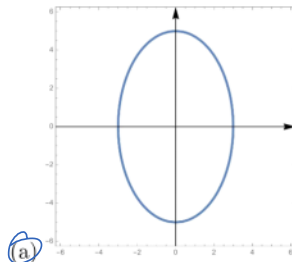
3. In the standard equation of an ellipse, the relationship between $a, b,$ and c can be described by the following equation

   (a) $c = a + b$
   (b) $c^2 = a^2 + b^2$
   (c) $c^2 = a^2 - b^2$
   (d) $c^2 = b^2 - a^2$
   (e) None of the above

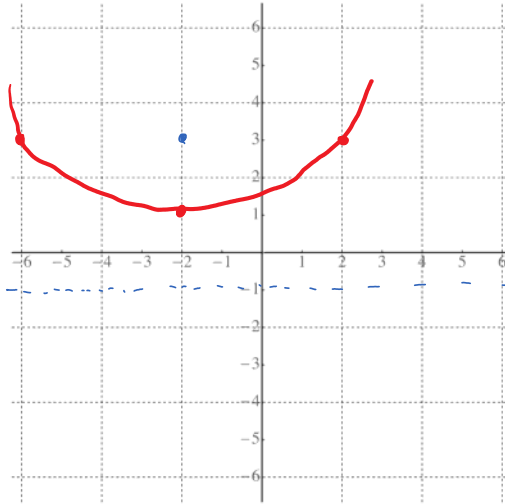4. A parabola has the vertex at $(1, -2)$ and the focus at $(1, 1)$. The equation of the directrix is

   (a) $y = 4$
   (b) $y = -5$
   (c) $x = 1$
   (d) $x = 0$
   (e) None of the above

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Part II

5. Find the equation of the parabola with focus $(-2, 3)$ and the directrix $y = -1$. Graph the parabola.

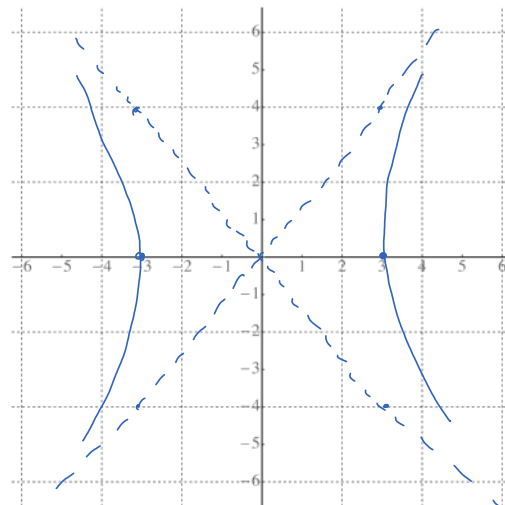$p = 2$, vertex: $(-2, 1)$, opens up

$(x+2)^2 = 4 \cdot 2 (y-1)$

$\boxed{(x+2)^2 = 8(y-1)}$

$y = 3 \rightarrow (x+2)^2 = 8(2) = 16$

$\qquad\qquad x + 2 = \pm 4$

$\qquad\qquad \underline{x = -2 \pm 4}$

6. Graph the equation $\frac{x^2}{9} - \frac{y^2}{16} = 1$. Find the center, vertices, and foci. If it is a hyperbola give the equations of asymptotes.

center: $(0, 0)$ $\Big\}$ hyperbola
$a^2 = 9$, $b^2 = 16$

$c^2 = 16 + 9 = 25$
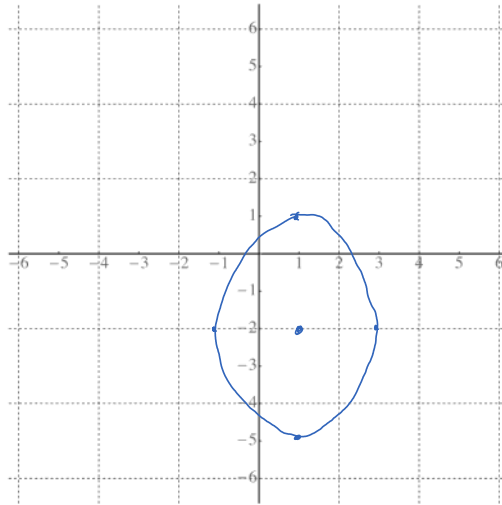
$c = 5$

foci: $(\pm 5, 0)$

vertices: $(\pm 3, 0)$

asymp: $y = \pm \frac{4}{3} x$

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7. Write the standard equation of the the conic given by the following equation:

$$9x^2 + 4y^2 - 18x + 16y - 11 = 0.$$

Graph the equation and give coordinates of center, foci, vertices, directrix and asymptopes, if any.

$$9x^2 - 18x + 4y^2 + 16y = 11$$

$$9(x^2 - 2x + 1) + 4(y^2 + 4y + 4) = 11$$
$$+ 9 \cdot 1$$
$$+ 4 \cdot 4$$

$$9(x-1)^2 + 4(y+2)^2 = 36$$

$$\frac{(x-1)^2}{4} + \frac{(y+2)^2}{9} = 36$$

$$a^2 = 9, \quad b^2 = 4$$

$$c^2 = 9 - 4 = 5$$

$$c = \sqrt{5}$$

center: $(1, -2)$

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

vertices: $(1, -2 \pm 3)$

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