## Exam #4, ver. B

April 4, 2017

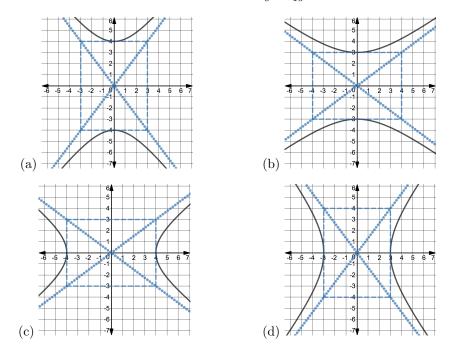
Name \_\_\_\_\_\_

- 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 5 multiple choice questions worth 5 points each. Part II contains 3 open ended questions worth 30 points each if not stated otherwise.

## Part I

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

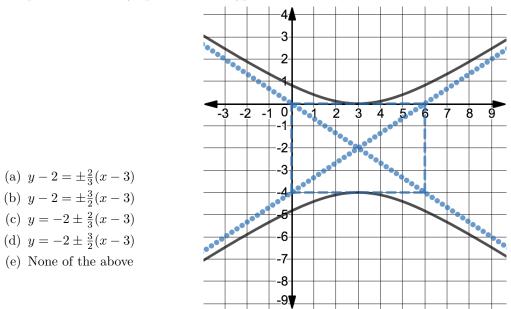
- 1. Which of the following is the equation of a hyperbola?
  - (a)  $x^2 + y^2 + 6x 2y + 6 = 0$
  - (b)  $y^2 + 12x + 2y 23 = 0$
  - (c)  $9x^2 + 25y^2 54x + 50y 119 = 0$
  - (d)  $4x^2 25y^2 24x + 250y 489 = 0$
  - (e) None of the above
- 2. Which of the following is the graph of the equation  $\frac{x^2}{9} \frac{y^2}{16} = 1$ ?



3. In the standard equation of an hyperbola,  $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ , the relationship between a, b, and c can be described by the following equation

- (a)  $a^2 = b^2 + c^2$
- (b)  $b^2 = a^2 + c^2$
- (c)  $c^2 = b^2 + a^2$
- (d) None of the above
- 4. A parabola has the vertex at (0,0) and the focus at (0,4). The equation of the directrix is
  - (a) y = 4
  - (b) y = -4
  - (c) x = 4
  - (d) x = -4
  - (e) None of the above

5. The equations of the asymptotes for the hyperbola below are



## Part II

6. (25 pts) Find the equation of the hyperbola with vertices (-5, 0), (5, 0) and a focus  $(\sqrt{21}, 0)$ . Graph the hyperbola and find the equations of asymptotes.

|             |                |         |           | 9                                          |          |       |                |            |      |
|-------------|----------------|---------|-----------|--------------------------------------------|----------|-------|----------------|------------|------|
|             |                |         |           | _                                          |          |       |                |            |      |
|             |                |         |           | 8                                          |          |       |                |            |      |
|             |                |         |           | 7                                          |          |       |                |            |      |
|             | ,<br>          |         |           | 6                                          |          |       |                |            |      |
|             |                |         |           | 5                                          | -        |       |                |            |      |
|             | <br> <br> <br> |         | <br> <br> | 4                                          |          |       | <br> <br> <br> |            |      |
|             |                |         |           | 3                                          |          |       |                |            |      |
|             |                | 1       |           | 5                                          | -        |       | 1              | 1          |      |
|             |                |         |           | 2                                          |          |       |                |            |      |
|             |                |         |           | 1                                          |          |       |                |            |      |
|             | i              | i       |           |                                            |          | i.    | i              |            |      |
| 0           | 8 7            | 6 5     | 1 3       | 2 1                                        | 1 /      | 2 2   |                | 6 7        | 0 0  |
| -9 -        | 8 - 7 -        | 6 - 5 - | 4 -3 -    | 2 - 1 - 1                                  | 1 2      | 2 3 4 | 4 5 (          | 5 7        | 8 9  |
| -9 -        | 8 -7 -         | 6 - 5 - | 4 -3 -    | 2 -1<br>-1<br>-2                           | 1 2      | 2 3 4 | 1 5 (          | 5 7        | 8 9  |
| _9 _        | 8 -7 -         | 6 –5 –  | 4 -3 -    | -1<br>2                                    | 1 2      | 2 3 4 | 4 5 (          | 5 7        | 8 9  |
| _9 _        | 8 –7 –         | 6 – 5 – | 4 -3 -    | -1                                         | 1 2      | 2 3 4 | 1 5 (          | 5 7        | 8 9  |
| <u>-9</u> _ | 8 –7 –         | 6 –5 –  | 4 -3 -    | -1<br>-2<br>-3<br>4                        | 1 2<br>- | 2 3 4 | 1 5 (          | 5 7        | 8 9  |
| <u>-9</u> _ | 8 -7 -         | 6 – 5 – | 4 -3 -    | -1<br>2                                    | 1 2      | 2 3 4 | 5 (            | 5 7        | 89   |
| <u>-9</u> _ | 8 –7 –         | 6 – 5 – | 4 -3 -    | -1<br>-2<br>-3<br>4                        | 1 :      | 2 3 4 | 5 (            | <u>5</u> 7 | 8 9  |
| <u>-9</u> - | 8 –7 –         | 6 –5 –  | 4 -3 -    | -1<br>-2<br>-3<br>4                        | 1 :      | 2 3 4 | 5 (            | <u>5</u> 7 | 8 9  |
| <u>-9</u> - | 8 –7 –         | 6 –5 –  | 4 -3 -    | -1<br>-3<br>-5<br>-7                       | 1 :      | 2 3 4 | 5 (            | 5 7        | 8 9  |
| <u>-9</u> - | 8 -7 -         | 6 –5 –  | 4 -3 -    | -1<br>-2<br>-3<br>4<br>-5<br>7<br>-7<br>-7 |          | 2 3 4 | 5 (            | 5 7        | \$ 9 |
| <u>-9</u> - | 8 -7 -         | 6 –5 –  | 4 -3 -    | -1<br>-3<br>-5<br>-7                       |          | 2 3 4 | 5 (            | 5 7        | 8 9  |

7. Transform the general equation of an ellipse below into its standard form. Graph the ellipse and determine the coordinates of the center, vertices and foci.

$$9x^2 + 16y^2 + 32y - 128 = 0$$

|          | :       | :       | : :     | 1                                     | I       | :     | :      | :     | :    |
|----------|---------|---------|---------|---------------------------------------|---------|-------|--------|-------|------|
|          |         |         |         | 9                                     | -       |       |        |       |      |
|          |         |         |         |                                       |         |       |        |       |      |
|          |         |         |         | -                                     |         |       |        |       |      |
|          |         |         |         | 7                                     | -       |       |        |       |      |
|          |         |         |         | 6                                     |         |       |        |       |      |
|          |         |         |         | 5                                     |         |       |        |       |      |
|          |         |         |         | 4                                     |         |       |        |       |      |
|          |         |         |         | 4                                     |         |       |        |       |      |
|          |         |         |         | 3                                     | -       |       |        |       |      |
|          |         |         |         | 2                                     |         |       |        |       |      |
|          |         |         |         | 1                                     |         |       |        |       |      |
|          |         |         |         | 1                                     |         |       |        |       |      |
| _        |         |         |         |                                       |         |       |        |       |      |
| -9 -     | 8 - 7 - | 6 - 5 - | 4 - 3 - | 2 - 1                                 | 1 (     | 2 3 4 | 1 5 (  | 57    | 8 9  |
| -9 -     | 8 -7 -  | 6 -5 -  | 4 -3 -  | $2 - 1 \\ -1$                         | 1 1     | 234   | 1 5 (  | 57    | 89   |
| -9 -     | 8 -7 -  | 6 -5 -  | 4 -3 -  | 2 -1<br>-1<br>-2                      | 1 2     | 2 3 4 | 4 5 (  | 57    | 89   |
| _9 _<br> | 8 –7 –  | 6 -5 -  | 4 -3 -  | 2                                     | 1 2     | 2 3 4 | \$ 5 ( | 5 7   | 89   |
| -9 -     | 8 -7 -  | 6 –5 –  | 4 -3 -  |                                       | 1 :<br> | 2 3 4 | 5 (    | 5 7   | \$ 9 |
| _9 _<br> | 8 -7 -  | 6 –5 –  | 4 -3 -  | 2                                     | 1 :     | 2 3 4 | 1 5 (  | 5 7   | 8 9  |
| -9 -     | 8 –7 –  | 6 –5 –  | 4 -3 -  |                                       |         | 2 3 4 | 5 (    | 57    | 8 9  |
| _9 _<br> | 8 –7 –  | 6 –5 –  | 4 -3 -  | 2<br>3<br>4<br>-5                     |         | 2 3 4 | 4 5 (  | 5 7 8 | 8 9  |
| _9 _<br> | 8 -7 -  | 6 –5 –  | 4 -3 -  | 2<br>3<br>4<br>5<br>6                 | i :     | 2 3 4 | 1 5 (  | 5 7 8 | \$ 9 |
| _9 _<br> | 8 -7 -  | 6 –5 –  | 4 -3 -  | 2<br>3<br>4<br>5<br>6<br>-7           |         | 2 3 4 | 1 5 (  | 5 7 1 | \$ 9 |
| _9 _<br> | 8 –7 –  | 6 –5 –  | 4 –3 –  | 2<br>3<br>4<br>5<br>6<br>-7<br>7<br>8 |         | 2 3 4 | 1 5 (  | 5 7 1 | 8 9  |
| _9 _<br> | 8 –7 –  | 6 –5 –  | 4 -3 -  | 2<br>3<br>4<br>5<br>6<br>-7<br>7<br>8 |         | 2 3 4 | 1 5 (  | 5 7 1 | \$ 9 |
| _9 _<br> | 8 –7 –  | 6 –5 –  | 4 -3 -  | 2<br>3<br>4<br>5<br>6<br>-7           |         | 2 3 4 | \$ 5 ( | 5 7 1 | \$ 9 |

8. Find the vertex, focus and the equation of the directrix for the parabola

$$(x+1)^2 = 8(y-2)$$

Graph the parabola.

|              |         |        |         | 9                                          |                       |       |       |     |          |
|--------------|---------|--------|---------|--------------------------------------------|-----------------------|-------|-------|-----|----------|
|              |         |        |         | -                                          |                       |       |       |     | 1        |
|              |         |        |         | 8                                          |                       |       |       |     |          |
|              |         |        |         | 7                                          | -                     |       |       |     |          |
|              |         |        |         | 6                                          |                       |       |       |     |          |
|              |         |        |         | 5                                          |                       |       |       |     | 1        |
|              |         |        |         | 3                                          |                       |       |       |     |          |
|              |         |        |         | 4                                          |                       |       |       |     |          |
|              |         |        |         | 3                                          | -                     |       |       |     |          |
|              |         |        |         |                                            |                       |       |       |     |          |
|              |         |        |         | 1                                          |                       |       |       |     |          |
|              |         |        |         | 1                                          | -                     |       |       |     |          |
|              |         |        |         |                                            |                       |       |       |     |          |
| 0            | 8 7     | 6 5    | 1 3     | 2 1                                        | 1 /                   | 3 3   | 5 /   | 5 7 | 8 0      |
| -9 -         | 8 - 7 - | 6 -5 - | 4 - 3 - | 2 - 1 - 1                                  | 1 2                   | 2 3 4 | 1 5 ( | 57  | 8 9      |
| -9 -         | 8 - 7 - | 6 -5 - | 4 -3 -  | -1                                         | 1 2                   | 2 3 4 | 15(   | 5 7 | 8 9      |
| <u>-</u> 9 - | 8 -7 -  | 6 -5 - | 4 -3 -  | -1<br>2                                    | 1 2                   | 2 3 4 | 1 5 ( | 5 7 | 89       |
| <u>-</u> 9 – | 8 –7 –  | 6 –5 – | 4 -3 -  | -1                                         | 1 2                   | 2 3 4 | 5 (   | 5 7 | \$ 9     |
| <u> </u>     | 8 -7 -  | 6 –5 – | 4 -3 -  | -1<br>2                                    | 1 2                   | 2 3 4 | 5 (   | 5 7 | 8 9      |
| <u>-</u> 9 – | 8 –7 –  | 6 –5 – | 4 -3 -  | -1<br>2<br>-3<br>4                         | 1 2<br>-<br>-         | 2 3 2 | 5 (   | 5 7 | 8 9      |
| <u>-9</u> _  | 8 -7 -  | 6 –5 – | 4 – 3 – | -1<br>-2<br>-3<br>4<br>-5                  | 1 2                   | 2 3 4 | 5 (   | 5 7 | 8 9      |
| <u>-9</u> -  | 8 -7 -  | 6 –5 – | 4 -3 -  | -1<br>2<br>3<br>4<br>-5<br>6               | - 1 2<br>             | 2 3 4 | 5 (   | 5 7 | 8 9      |
| <u>-9</u> _  | 8 –7 –  | 6 –5 – | 4 -3 -  | -1<br>-2<br>-3<br>4<br>-5                  | - 1 2<br>             | 2 3 4 | 5 (   | 5 7 | \$ 9     |
| <u>-9</u> _  | 8 –7 –  | 6 –5 – | 4 -3 -  | -1<br>-3<br>-5<br>-7                       | . 1 2                 | 3 4   | 5 (   | 5 7 | \$ 9     |
| <u>-9</u> _  | 8 –7 –  | 6 –5 – | 4 - 3 - | -1<br>-2<br>-3<br>4<br>-5<br>7<br>-7<br>-7 | -<br>-<br>-<br>-<br>- | 2 3 4 | 5 (   | 5 7 | \$ 9     |
| <u>-9</u> _  | 8 –7 –  | 6 –5 – | 4 -3 -  | -1<br>-3<br>-5<br>-7                       | -<br>-<br>-<br>-<br>- |       | 5 (   | 5 7 | <u>9</u> |

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