MATH 1121 - Fall 2015 - Dr. Clontz - Test 1

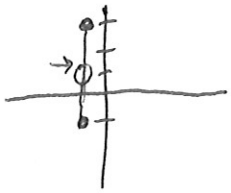
Name: Answers Section: _____

- This test is worth 250 points toward your overall grade. Each problem is labeled with its value toward this total.
- On multiple choice problems, you do not need to show your work. No partial credit will be given.
- On full response problems, show all of your work and give a complete solution. When in doubt, don't skip any steps. Partial credit will be given at the discretion of the instructor.
- This exam is open notes, provided that these notes are completely in your own handwriting. The professor may take up notes you use with your test and return them after the test is graded.
- Tests submitted after the end of 70 minutes will be deducted 25 points, with 25 more points deducted every following minute.

Multiple Choice (150 points total)

1. (15 points) Two endpoints of a line segment are $(-1, -1)$ and $(-1, 3)$. What must the y-coordinate of the line segment's midpoint be?

   ○ -1
   ○ 0
   ● 1
   ○ 3
   ○ None of these



2. (15 points) What is the distance between the points with coordinates $(3, -2)$ and $(0, -6)$?

   ● 5
   ○ $\sqrt{7}$
   ○ $\sqrt{35}$
   ○ 25
   ○ None of these

$\sqrt{(3-0)^2+(-2+6)^2}$

$\sqrt{9+16} = \sqrt{25} = 5$

3. (15 points) Consider the lines with equations $y = \frac{1}{2}x + 5$ and $2x + y + 3 = 0$. Which of these statements is true?

$y = -2x - 3$

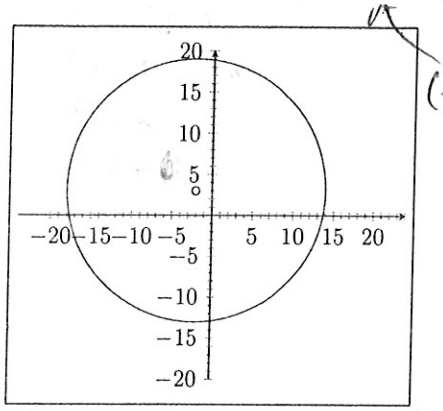
   ○ The lines are parallel, but not perpendicular.
   ● The lines are perpendicular, but not parallel.
   ○ The lines are both parallel and perpendicular.
   ○ The lines are neither parallel nor perpendicular.
   ○ None of these.

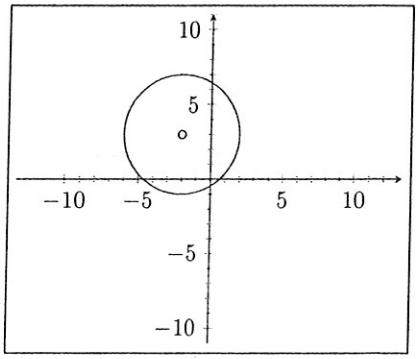
4. (15 points) Which of the following plots corresponds to the circle with the following equation?

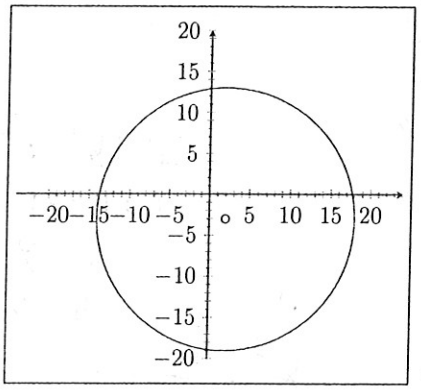
$$(x+2)^2 + (y-3)^2 = 16$$

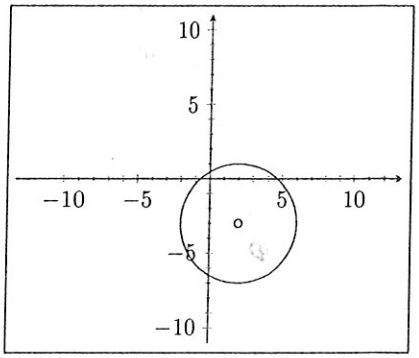
$r = \sqrt{16} = 4$

$(-2, 3)$

○ 

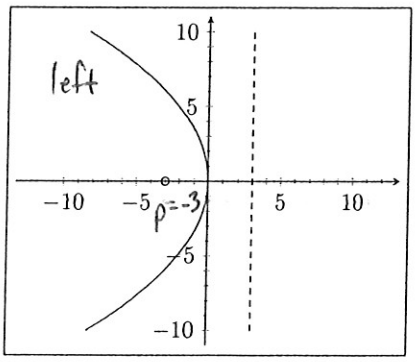
● 

○ 

○ 

○ None of these.

5. (15 points) Which of the following equations corresponds to the parabola sketched here?



$y^2 = 4(-3)x$

$y^2 = -12x$

$x = -\frac{y^2}{12}$

○ $y = \frac{x^2}{12}$

○ $x = \frac{y^2}{12}$

○ $y = -\frac{x^2}{12}$

● $x = -\frac{y^2}{12}$

○ None of these.

6. (15 points) Consider the ellipse with equation $\frac{x^2}{25} + \frac{y^2}{9} = 1$. Every point on this ellipse must be equidistant from which pair of points?

- (●) $(4, 0)$ and $(-4, 0)$
- ( ) $(0, 4)$ and $(0, -4)$
- ( ) $(34, 0)$ and $(-34, 0)$
- ( ) $(0, 34)$ and $(0, -34)$
- ( ) None of these.

$a^2 - b^2 = c^2$
$25 - 9 = c^2$
$16 = c^2$
$4 = c$

7. (15 points) Which of these is an equation of the hyperbola centered at the origin with a focus at $(0, \sqrt{13})$ and vertex at $(0, -2)$?

- ( ) $\frac{y^2}{13} - \frac{x^2}{4} = 1$
- ( ) $\frac{y^2}{13} - \frac{x^2}{9} = 1$
- (●) $\frac{y^2}{4} - \frac{x^2}{9} = 1$
- ( ) $\frac{y^2}{4} - \frac{x^2}{13} = 1$
- ( ) None of these.

$a^2 + b^2 = c^2$
$4 + b^2 = 13$
$b^2 = 9$
$b = 3$
$\frac{y^2}{4} - \frac{x^2}{9} = 1$

8. (15 points) Describe the translation of the graph with equation $(x - 2)^2 = 4(y + 1)$ in comparison to the graph with equation $x^2 = 4y$.

- (●) 2 units right and 1 unit down.
- ( ) 2 units left and 1 unit down.
- ( ) 2 units right and 1 unit up.
- ( ) 2 units up and 1 unit left.
- ( ) None of these.

x: horiz. neg: right 2
y: vert. pos: down 1

9. (15 points) Which of these is a simplification of the following algebraic function?

$$f(x) = \frac{(3x+1)(2x^{-1/2}) - 2x^{1/2}(3)}{(3x+1)^2}$$

- ○ $f(x) = \dfrac{2x-1}{(6x+\sqrt{x})^2}$
- ○ $f(x) = \dfrac{6x-3}{x^{1/2}(3x+1)^2}$
- ○ $f(x) = \dfrac{x^{1/2}}{3x+1}$
- ○ $f(x) = \dfrac{2x}{x^{1/2}(3x+1)^{1/2}}$
- ● None of these.

$$= \frac{(3x+1)(2) - 2x(3)}{x^{1/2}(3x+1)^2}$$

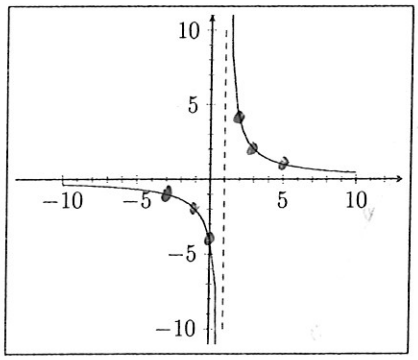
$$= \frac{6x + 2 - 6x}{x^{1/2}(3x+1)^2}$$

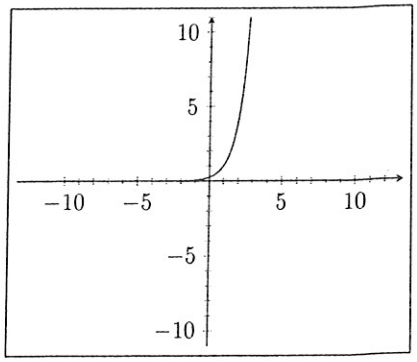
$$= \frac{2}{x^{1/2}(3x+1)^2}$$

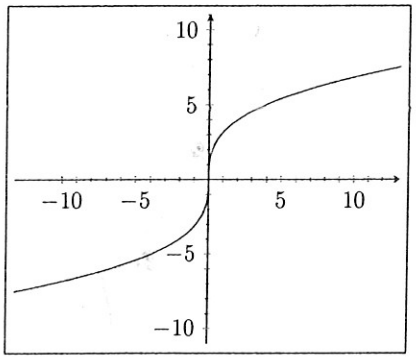
x	y
-3	-1
-1	-2
0	-4
⋮	⋮

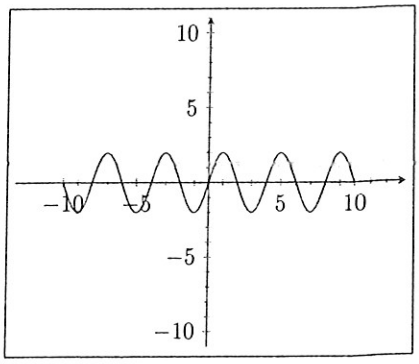
x	y
2	4
3	2
5	1
⋮	⋮

10. (15 points) Which of these is the graph of the function $g(x) = \frac{4}{x-1}$?

● 

○ 

○ 

○ 

○ None of these.

(or $y = \frac{4}{x-1} \Rightarrow (x-1)(y) = 2^2$, sim. to $xy = 2^2$)

Full Response (100 points total)

11. (20 points) Show how to find an equation for the line passing through the point $(3, -2)$ with slope -2, and then sketch it on the given coordinate plane.

$y = mx + b$

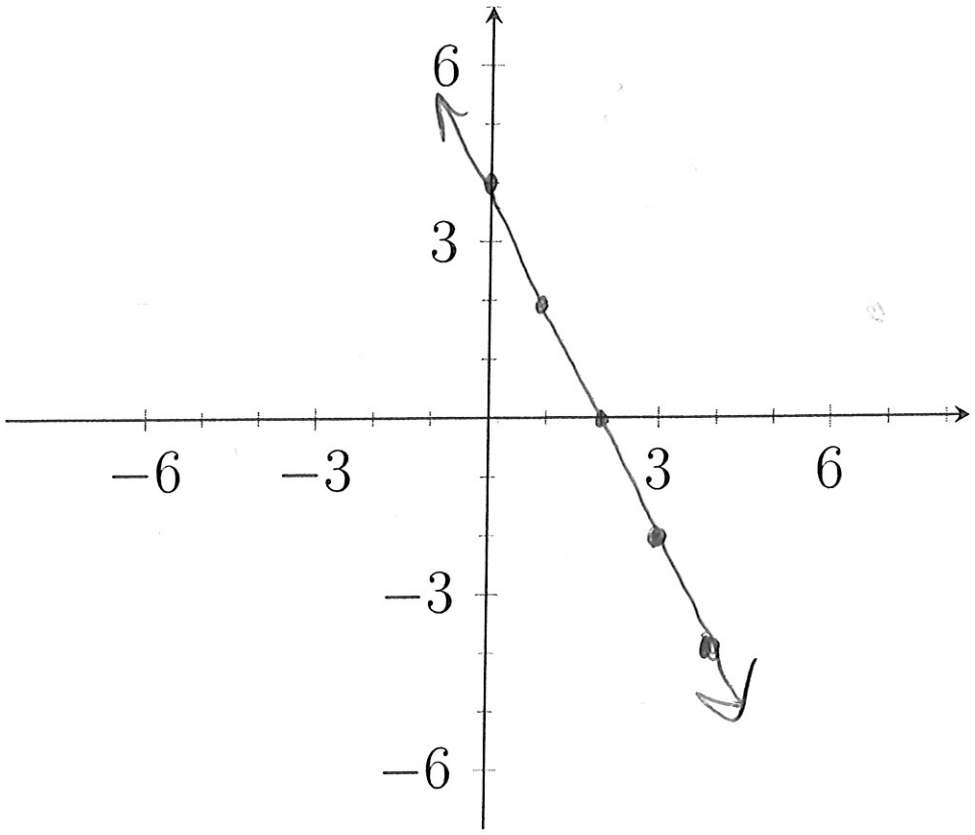
$y = -2x + b$

$-2 = -2(3) + b$

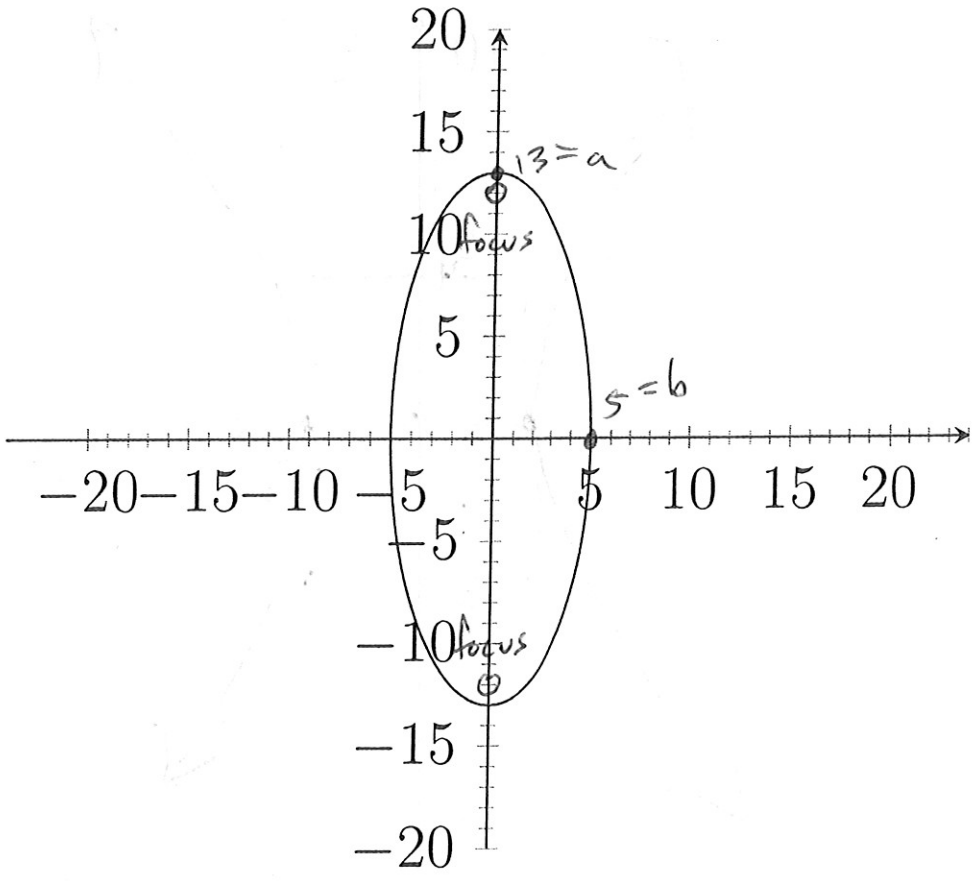
$-2 = -6 + b$

$4 = b$

$y = -2x + 4$



12. (20 points) Give the equation of the below graph, and add its foci to the graph.



$\frac{y^2}{13^2} + \frac{x^2}{5^2} = 1$

$\boxed{\frac{y^2}{169} + \frac{x^2}{25} = 1}$

$a^2 - b^2 = c^2$

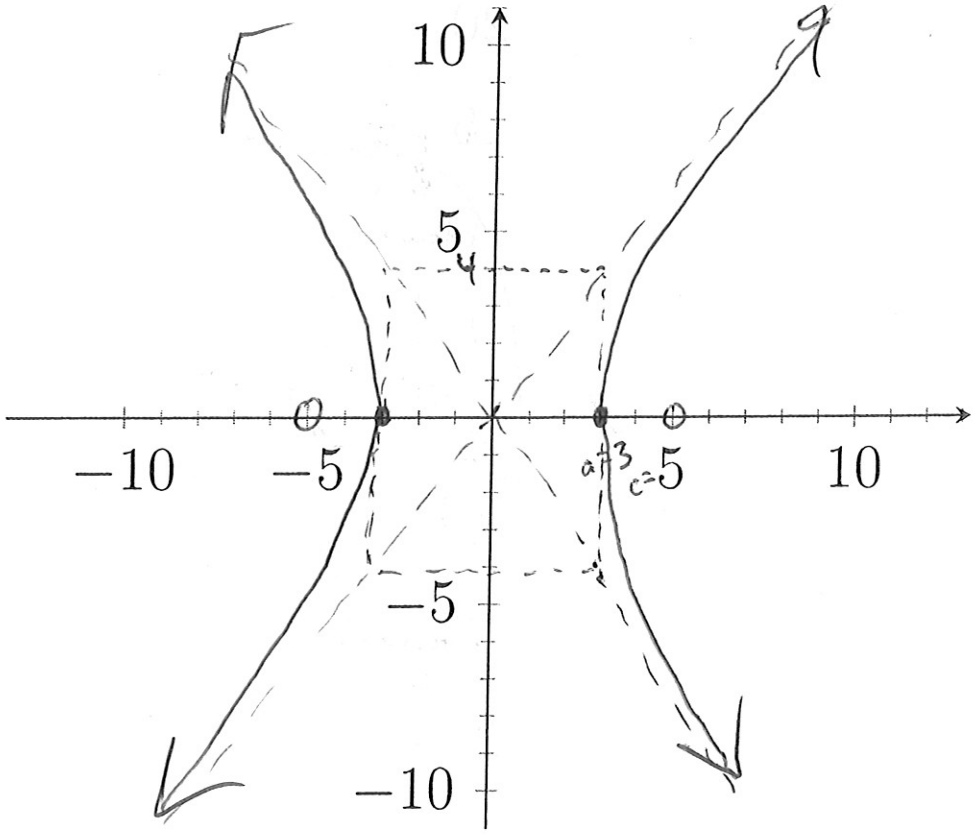
$169 - 25 = c^2$

$144 = c^2$

$12 = c$

foci @ ± 12

13. (20 points) Sketch the hyperbola centered at the origin with vertex $(-3, 0)$ and focus $(-5, 0)$, including its asymptotes and other focus.



$a^2 + b^2 = c^2$

$9 + b^2 = 25$

$b^2 = 16$

$b = 4$

14. (20 points) Use algebra to manipulate $x^2 - 6x + 8y + 17 = 0$ to get the equation of a translated parabola. (You do not need to sketch the graph. Hint: the parabola has its vertex at $(3, -1)$.)

$x^2 - 6x + 8y + 17 =$

$x^2 - 6x = -8y - 17$

$x^2 - 6x + 9 = -8y - 17 + 9$

$(x-3)^2 = -8y - 8$

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

15. (20 points) Give a simplified expression for the composition $(f \circ g)(x)$ given $f(x) = x^2 - 3x$ and $g(x) = 2x - 1$.

$$(f \circ g)(x) = f(g(x)) = f(2x-1)$$

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

$$= 4x^2 - 4x + 1 - 6x + 3$$

$$= \boxed{4x^2 - 10x + 4}$$

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

$$= \boxed{2(x-2)(2x-1)}$$