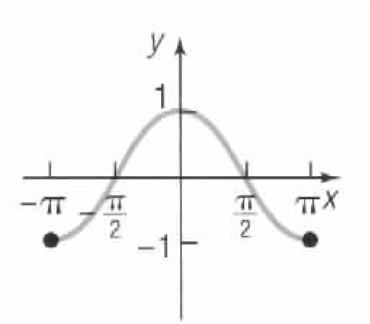
Student name: SOLUTION

Questions 1-12 are worth a total of 100 points. Questions 13-16 are for extra credit, worth 5 points each.

1. List the intercepts of this graph



Y intercept: $(0, 1)$ X intercepts: $(\frac{\pi}{2}, 0)$ and $(-\frac{\pi}{2}, 0)$

2. Solve for x by completing the square. Show your work.

$x^2 - 6x = 27$

The square will be $(x-3)^2$

$x^2 - 6x + 9 = 27 + 9$

$(x-3)^2 = 36$

$x - 3 = \pm\sqrt{36} = \pm 6$

$x = 3 \pm 6$

$x = -3$ or $x = 9$

Check: $(-3)^2 - 6(-3) = 9 + 18 = 27\ ok$

$9^2 - 6 * 9 = 81 - 54 = 27\ \ ok$

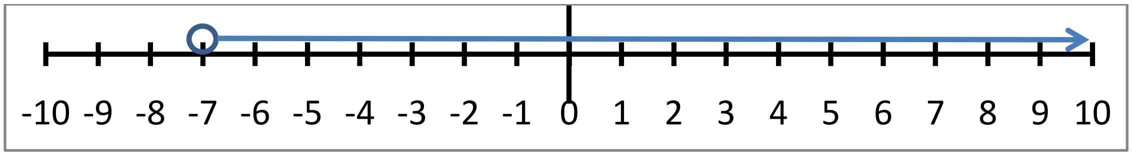
3. Solve for x, express the result as an interval (round/square brackets) and draw it on a number line. Show your work.

$-2(x+3) < 8$

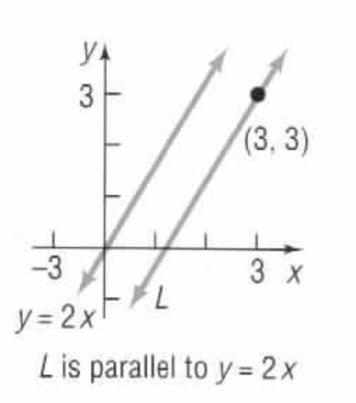
$x + 3 > \frac{8}{-2} = -4$

$x > -7$

$(-7, \infty)$



4. Write an equation of the line L . Show your work.



The slope of $y = 2x$ is 2, so the slope of L is also 2

The equation of L in slope-intercept form is $y = 2x + b$

The point $(3,3)$ is on L so

$3 = 2 * 3 + b$

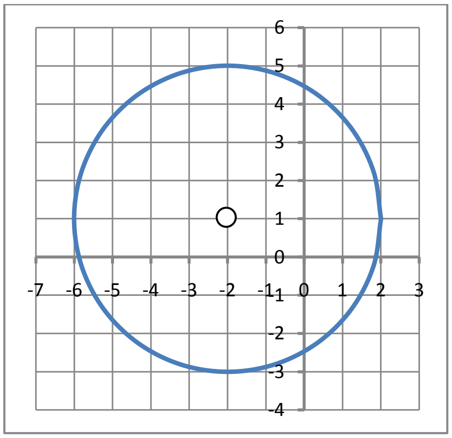
Solve for b:

$3 = 6 + b$

$-3 = b$

The equation of L is $y = 2x - 3$

5. Equations of circles:
   a. Write an equation of this circle



Center is $(-2,1)$.

Radius is 4

The equation of a circle in standard form is $(x-h)^2 + (y-k)^2 = r^2$

For this circle, $\left(x-(-2)\right)^2 + (y-1)^2 = 4^2$

That is, $(x+2)^2 + (y-1)^2 = 16$

   b. What are the center and radius of a circle with this equation?

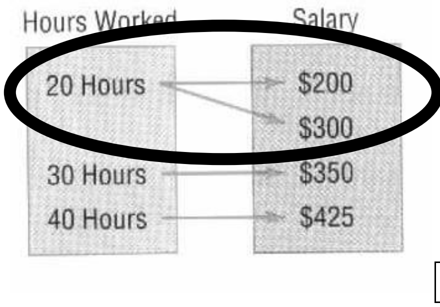
$(x-3)^2 + y^2 = 5$

The equation of a circle in standard form is $(x-h)^2 + (y-k)^2 = r^2$

Center is $(3,0)$

Radius is $\sqrt{5}$

6. Which of the following define y as a function of x? If not, show why not
   a. x: Hours worked, y: Salary



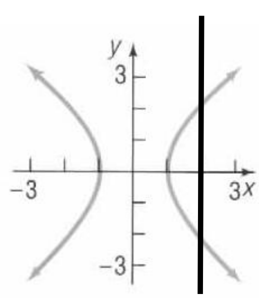
NO

   b. $\{(-2,4),(-1,1),(0,0),(1,1)\}$ **YES**

   c. $y = \frac{1}{x}$ **YES**

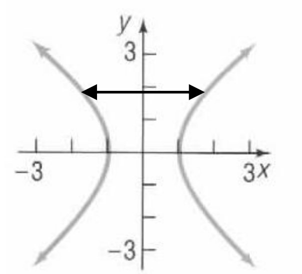
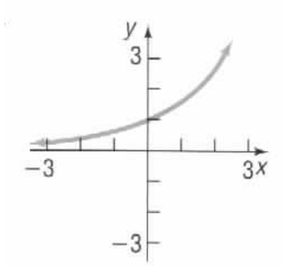
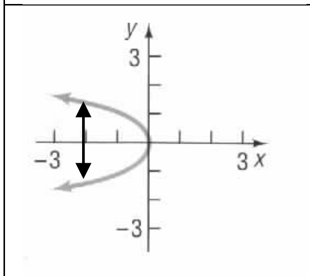
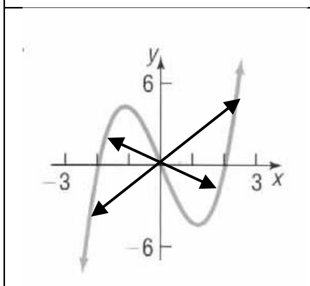
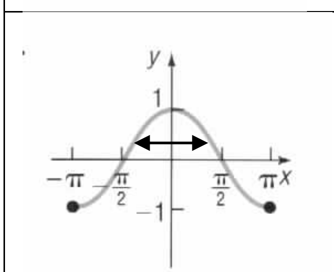
   d. $y^2 = 4 - x^2$ **NO**
   Solve for y: $y = \pm\sqrt{4 - x^2}$ which has w values if $-2 < x < 2$

   e.



NO fails the straight line test

7. For each graph, which symmetry or symmetries apply? Circle your answer

	X-axis Y-axis Origin None
	X-axis Y-axis Origin None
	X-axis Y-axis Origin None
	X-axis Y-axis Origin None
	X-axis Y-axis Origin None

8. What is the domain of each of these functions? Show your work.
   a. $g(x) = \frac{x}{x^2-16}$

      OK except for denominator$= 0$

      $x^2 - 16 \neq 0$

      $(x+4)(x-4) \neq 0$

      $(x+4) \neq 0$ and $(x-4) \neq 0$

$x \neq 4\ or - 4$
All x except $4\ and - 4$

   b. $h(x) = \sqrt{3x-12}$

      OK except $\sqrt{< 0}$

      So $3x - 12 \geq 0$

      $3x \geq 12$

$x \geq 4$
$[4, \infty)$

9. If $f(x) = \frac{2x+1}{3x-5}$ then evaluate: (Show your work.)

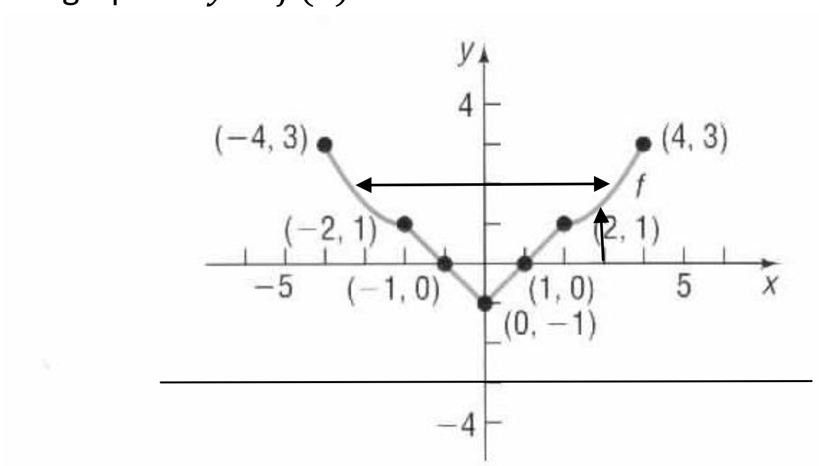
a. $f(0)$

$f(0) = \frac{2*0+1}{3*0-5} = -\frac{1}{5}$

b. $f(-x)$

$f(-x) = \frac{2*(-x)+1}{3*(-x)-5} = \frac{-2x+1}{-3x-5}$

10. The graph of $y = f(x)$ is shown below:



a. Is $f(x)$ even, odd, or neither? EVEN

b. Is $f(3)$ positive, negative, or zero? POSITIVE

c. How often does the line $y = -3$ intersect the graph? ZERO TIMES

11. Calculate:
   a. $(2-3i)+(6+8i)$
   $(2-3i)+(6+8i)=(2+6)+(-3i+8i)=8+5i$

   b. $2i(2-3i)$
   $2i(2-3i)=2i*2-2i*3i=4i-6i^2=4i-6(-1)=6+4i$

12. Does the equation $x^2+x+1=0$ have 0, 1, or 2 *real* solutions? Show your work.

Discriminant: $D=b^2-4ac=1^2-4*1*1=-3$
So there are 0 real solutions

Extra credit - Show your work for all of them.

13. Solve for x: $\frac{x}{x-2} + 3 = \frac{2}{x-2}$.

$$\frac{x}{x-2} + \frac{3(x-2)}{x-2} = \frac{2}{x-2}$$
$$\frac{x}{x-2} + \frac{3(x-2)}{x-2} = \frac{2}{x-2}$$
$$\frac{x+3x-6}{x-2} = \frac{2}{x-2}$$
$$\frac{4x-6}{x-2} = \frac{2}{x-2}$$

Possible solution:

$$4x - 6 = 2$$
$$4x = 8$$
$$x = 2$$

Check: if $x = 2$ then the denominator $x - 2 = 0$

So there is NO SOLUTION

14. Solve for x.

$x + \sqrt{x} - 20 = 0$

Substitute $u = \sqrt{x}$ - then $x = u^2$

$u^2 + u - 20 = 0$

$(u+5)(u-4) = 0$

$u = -5 \; or \; 4$

But since $u = \sqrt{x}$ the solution $u = -5$ is not possible. This is because $\sqrt{x}$ is defined to be the ***non-negative*** square root.

If $u = 4$ then $\boxed{x = u^2 = 16}$

Check:

$16 + \sqrt{16} - 20 = 16 + 4 - 20 = 0 \;\; ok$

15. Calculate $\frac{6-i}{1+i}$

$$=\frac{6-i}{1+i}*\frac{1-i}{1-i}$$

$$=\frac{6-i-6i+i^2}{1+i-i-i^2}$$

$$=\frac{6-7i-1}{1-(-1)}=\boxed{\frac{5-7i}{2}=\frac{5}{2}-\frac{7}{2}i}$$

16. Find all solutions to $x^2+x+1=0$.

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

$$=\frac{-1\pm\sqrt{1^2-4*1*1}}{2*1}$$

$$=\frac{-1\pm\sqrt{-3}}{2}$$

$$=\frac{-1\pm\sqrt{3}\sqrt{-1}}{2}$$

$$=\frac{-1\pm\sqrt{3}i}{2}$$

$$=-\frac{1}{2}\pm\frac{\sqrt{3}}{2}i$$

Solutions are $x=-\frac{1}{2}-\frac{\sqrt{3}}{2}i\ and\ x=-\frac{1}{2}+\frac{\sqrt{3}}{2}i$