

1. (4pts) Find the equation of the line (in form  $y = mx + b$ ) that passes through points  $(3, -1)$  and  $(7, 1)$ .

$$m = \frac{1 - (-1)}{7 - 3} = \frac{2}{4} = \frac{1}{2}$$

$$y - 1 = \frac{1}{2}(x - 7) \quad \text{point-slope form}$$

$$y = \frac{1}{2}x - \frac{7}{2} + 1$$

$$y = \frac{1}{2}x - \frac{5}{2}$$

2. (7pts) Find the equation of the line (in form  $y = mx + b$ ) that is perpendicular to the line  $3x + 5y = 6$ , and passes through the  $x$ -intercept of that line. Draw both lines.

$$3x + 5y = 6$$

$$m_2 = -\frac{1}{m_1} = \frac{5}{3}$$

$$5y = -3x + 6$$

line through  $(2, 0)$

$$y = -\frac{3}{5}x + \frac{6}{5}$$

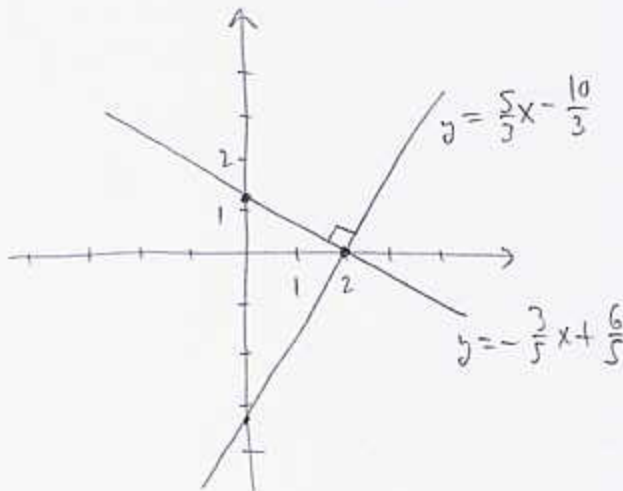
$$y - 0 = \frac{5}{3}(x - 2)$$

$x$ -intercept:  $y = 0$

$$y = \frac{5}{3}x - \frac{10}{3}$$

$$3x = 6$$

$$x = 2$$



3. (3pts) Let  $f(x) = \frac{3x - 4}{\sqrt{7 - 4x}}$ . Write the domain of this function in interval notation.

Must have  $7 - 4x > 0$

$$7 > 4x$$

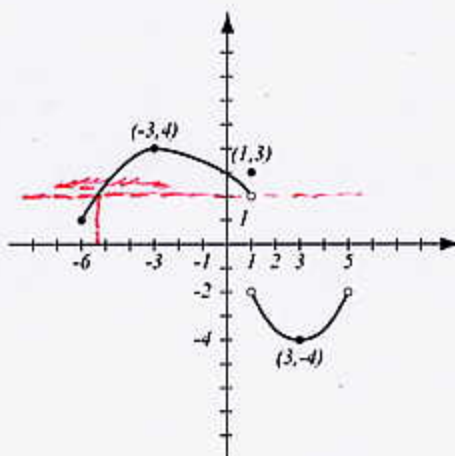
$$\frac{7}{4} > x$$

$$x < \frac{7}{4}$$

Domain:  $(-\infty, \frac{7}{4})$

4. (7pts) Use the graph of the function  $f$  at right to answer the following questions.

- a) What is the domain of  $f$ ?  $[-6, 5]$   
 b) What is the range of  $f$ ?  $[-4, -2) \cup [1, 4]$   
 c) Find  $f(-3)$  and  $f(1)$ .  $f(-3) = 4, f(1) = 3$   
 d) What are the solutions of the equation  $f(x) = 2$ ?  $x = -5.3$   
 e) Find intervals where  $f(x) < 0$ .

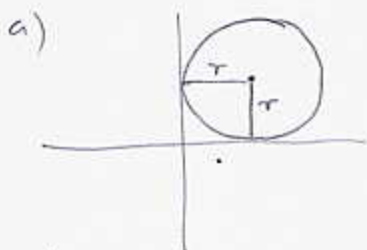


$x$ -coord  $1 < x < 5$   
 so  $(1, 5)$

5. (4pts) If  $g(x) = x^2 - 5x + 7$ , find  $g(x+3) - g(x+h)$ .

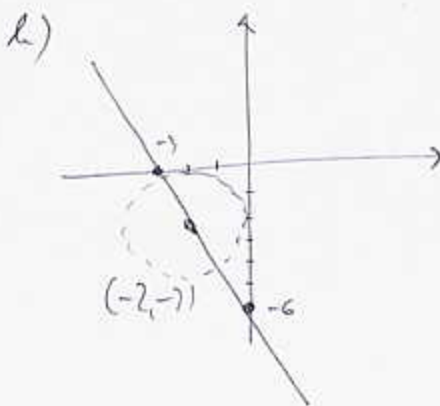
$$\begin{aligned} g(x+3) - g(x+h) &= (x+3)^2 - 5(x+3) + 7 - ((x+h)^2 - 5(x+h) + 7) \\ &= \cancel{x^2} + 6x + 9 - \cancel{5x} - 15 + 7 - (\cancel{x^2} + 2xh + h^2 - \cancel{5x} - 5h + 7) \\ &= 6x - 6 - 2xh - h^2 + 5h \\ &= (6 - 2h)x - h^2 + 5h - 6 \end{aligned}$$

6. (5pts) a) Draw a picture of any circle that is tangent to both  $x$  and  $y$  axes and write the equation of the circle.



In general

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



A circle with this property must have center of form  $(a, a)$ . Since the center is on  $y = -2x - 6$ , we must have  $a = -2a - 6$

$$\begin{aligned} 3a &= -6 \\ a &= -2 \end{aligned}$$

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