

Math 105 Practice Exam 2  
STEM SC

Formulas:

$$\frac{y_2 - y_1}{x_2 - x_1}$$

$$y - y_1 = m(x - x_1)$$

$$d = rt$$

$$I = Prt$$

$$A^\circ + B^\circ + C^\circ = 180$$

1. Given that

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

Find each of the following parts (a) to (c). Express each as a simplified fraction.

a)  $g(3)$

$$\frac{3+3}{3-4} = \frac{-6}{1}$$
$$= \boxed{-6}$$

b)  $g(-6)$

$$\frac{-6+3}{-6-4} = \frac{-3}{-10}$$
$$= \boxed{3/10}$$

c)  $g\left(\frac{7}{3}\right)$

$$\frac{7/3 + 3}{7/3 - 4} = \frac{7/3 + 9/3}{7/3 - 12/3}$$
$$= \frac{16/3}{-5/3} = \frac{16}{3} \cdot -\frac{3}{5} = -48/15 = \boxed{-16/5}$$

2. Find the  $y = mx + b$  form for the equation of the line through  $(5, -9)$  with slope  $-\frac{1}{5}$

$$y = -\frac{1}{5}x - 9$$

3. Consider the line  $3x - 5y = 11$ .

a) What is the slope?

$$\begin{aligned} 3x - 5y &= 11 \\ -5y &= 11 - 3x \\ y &= -\frac{11}{5} + \frac{3}{5}x \end{aligned}$$

$$m = \frac{3}{5}$$

b) What is the equation of the line perpendicular to this line through  $(1, -4)$ ? You may leave your line in the form  $y - y_1 = m(x - x_1)$ .

$$y + 4 = -\frac{5}{3}(x - 1)$$

4. Consider the line  $4x - 13y = 15$ .

a) What is the slope?

$$\begin{aligned} 4x - 13y &= 15 \\ -13y &= 15 - 4x \\ y &= -\frac{15}{13} + \frac{4}{13}x \end{aligned}$$

$$m = \frac{4}{13}$$

b) What is the equation of the line perpendicular to this line through  $(1, -4)$ ? You may leave your line in the form  $y - y_1 = m(x - x_1)$ .

$$y + 4 = -\frac{13}{4}(x - 1)$$

5. Consider the points  $(-4, 6)$  and  $(5, -8)$
- a) What is the slope through these points?

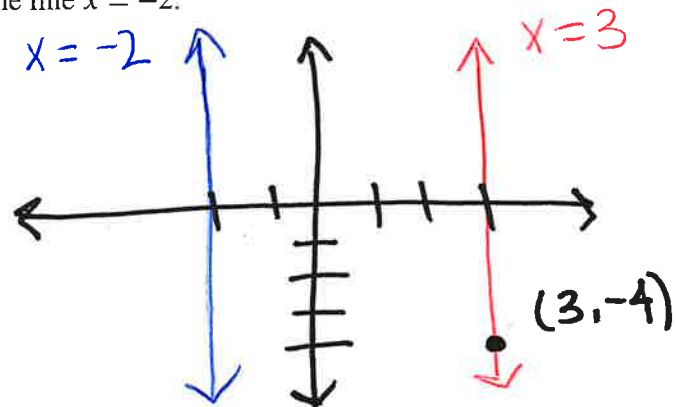
$$\frac{y_2 - y_1}{x_2 - x_1} = \frac{-8 - 6}{5 - (-4)} = \boxed{\frac{-14}{9}}$$

- b) What is the equation of the line through these points? You may leave your line in the form  $y - y_1 = m(x - x_1)$ .

$$\boxed{y - 6 = -14/9(x + 4)} \text{ OR } \boxed{y + 8 = -14/9(x - 5)}$$

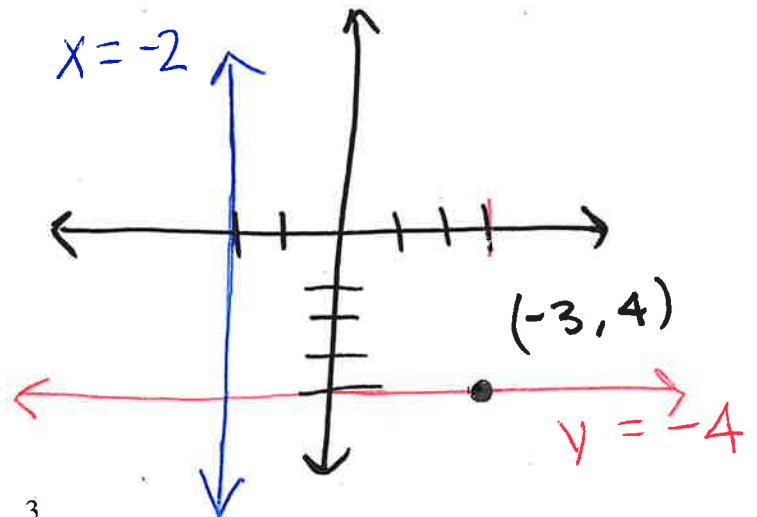
6. Find the equation of the line through  $(3, -4)$  parallel to the line  $x = -2$ .

$$\boxed{x = 3}$$



7. Find the equation of the line through  $(-3, 4)$  perpendicular to the line  $x = -2$ .

$$\boxed{y = -4}$$



8. Solve the equation

$$3(4x + 2) - 2(-x + 6) = 5(2x - 3)$$

$$12x + 6 + 2x - 12 = 10x - 15$$

$$14x - 6 = 10x - 15$$

$$4x = -9$$

$$x = -\frac{9}{4}$$

9. Solve the equation

$$5(5x - 2) - 2(5x + 1) = 3(5x - 4)$$

$$12x + 8 - 10x + 5 = 15x - 12$$

$$2x + 13 = 15x - 12$$

$$25 = 13x$$

$$x = \frac{25}{13}$$

10. Solve the equation

$$2 - 3(4x - 2) \leq 5x + 7$$

$$2 - 12x + 6 \leq 5x + 7$$

$$-12x + 8 \leq 5x + 7$$

$$-17x \leq -1$$

$$x \geq 1/17$$

11. Find the domain of  $f(x) = \sqrt{\frac{2}{7}x + \frac{5}{8}}$ .

$$\frac{2}{7}x + \frac{5}{8} \geq 0$$

$$\frac{2}{7}x \geq -\frac{5}{8}$$

$$x \geq -\frac{5}{8} \cdot \frac{7}{2}$$

$$x \geq -\frac{35}{16}$$

$$\left[ -\frac{35}{16}, +\infty \right)$$

12. A graph of the function  $f(x)$  is shown below. Using the graph, state the intervals where  $f(x)$  is increasing, decreasing, and constant. Also, state the relative maximum and minimum values for  $f(x)$ .

Increasing:

$$[0, 1], [2, +\infty)$$

Decreasing:

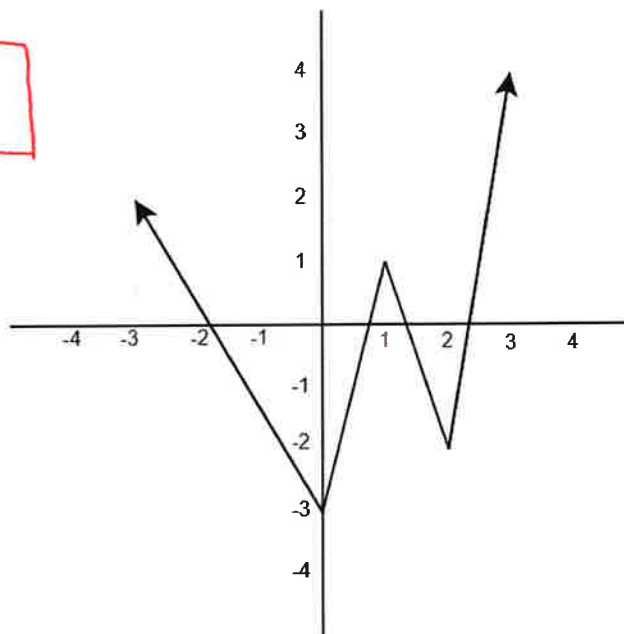
$$(-\infty, 0], [1, 2]$$

Relative Maximum:

$$1$$

Relative Minimum:

$$-3 \quad -2$$



13. Let

$$f(x) = \begin{cases} \frac{1}{2}x + 2, & x \leq 0, \\ x^2 - 1, & 0 < x \leq 3, \\ 4x - 5, & x > 3. \end{cases}$$

Find each of the following:

a) Find  $f(4)$

$$4x - 5$$

$$4(4) - 5$$

$$16 - 5$$

$$11$$

b)  $f(2)$

$$x^2 - 1$$

$$2^2 - 1$$

$$4 - 1$$

$$3$$

c)  $f(-1)$

$$\frac{1}{2}x + 2$$

$$\frac{1}{2}(-1) + 2$$

$$-\frac{1}{2} + \frac{4}{2}$$

$$\frac{3}{2}$$

14. Let  $f(x) = x^2 - 3$  and  $g(x) = 2x + 1$ . Calculate each of the following:

a)  $(f + g)(4)$

$$(f + g)(x) = x^2 - 3 + 2x + 1$$
$$= x^2 + 2x - 2$$

$$(f + g)(4) = 4^2 + 2(4) - 2$$

$$= 16 + 8 - 2$$

$$= 24 - 2$$

$$= 22$$

b)  $(fg)(3)$

$$(fg)(x) = (x^2 - 3)(2x + 1)$$
$$= 2x^3 + x^2 - 6x - 3$$

$$(fg)(3) = 2(3)^3 + 3^2 - 6(3) - 3$$
$$= 2(27) + 9 - 18 - 3$$

$$= 54 - 9 - 3 =$$

$$= 54 - 12$$

$$= 42$$

c)  $(g \circ g)(1)$

$$(g \circ g)(x) = 2(2x + 1) + 1$$
$$= 4x + 2 + 1$$
$$= 4x + 3$$

$$(g \circ g)(1) = 4(1) + 3$$
$$= 4 + 3$$

$$= 7$$

d)  $(f \circ g)(2)$

$$(f \circ g)(x) = (2x + 1)^2 - 3$$
$$= 4x^2 + 4x + 1 - 3$$
$$= 4x^2 + 4x - 2$$

$$(f \circ g)(2) = 4(2)^2 + 4(2) - 2$$
$$= 4(4) + 8 - 2$$

$$= 16 + 4$$

$$= 20$$

15. Let  $f(x) = \sqrt{3x-4}$  and  $g(x) = 2x+3$ . Determine  $(f/g)(x)$  and its domain.

$$(f/g)(x) =$$

$$\frac{\sqrt{3x-4}}{2x+3}$$

$$2x+3 \neq 0$$

$$2x \neq -3$$

$$x \neq -3/2$$

$$3x-4 \geq 0$$

$$3x \geq 4$$

$$x \geq 4/3$$

$$\left[ \frac{4}{3}, +\infty \right)$$

Not on exam

16. You start a bike ride at 20 mph. Your sibling starts the same ride 3 hours later at 30 mph. How long does it take your sibling to catch up to you?

$$\text{you: } d = 20(t+3)$$

$$\text{sibling: } d = 30t$$

$$30t = 20(t+3)$$

$$10t = 60$$

$$t = 6 \text{ hrs}$$

Note that you + your sibling travel the same distance

$$d = rt$$

$$d = 20 \text{ mph} / 30 = 60 \text{ mi}$$

$$r_{\text{new}} = 30 \text{ mph} - 20 \text{ mph} = 10 \text{ mph}$$

$$d = rt$$

$$60 \text{ mi} = 10 \text{ mph} \cdot t$$

$$t = 6 \text{ hrs}$$

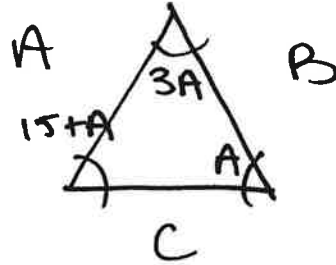


Not on exam

17. In triangle  $ABC$ , angle  $B$  has measure 15 degrees more than  $A$ , and  $C$  has three times the measure of  $A$ . What is the measure of  $A$ ?

$$\begin{aligned}A + B + C &= 180 \\3A + 15 + A + A &= 180 \\5A + 15 &= 180 \\5A &= 165\end{aligned}$$

$$A = 33$$



$$\begin{aligned}A &= A \\B &= 15 + A \\C &= 3A\end{aligned}$$

18. We invest \$1500 into two accounts, one at 5% and the other at 2%. If the total interest in two accounts after two years is \$85, how much is in the account at 5%?

$$\begin{aligned}I &= Prt \\&= P \cdot 0.05 \cdot 2 \\&= 0.1P\end{aligned}$$

$$\begin{aligned}I &= Prt \\&= (1500 - P) \cdot 0.02 \cdot 2 \\&= (1500 - P) \cdot 0.04 \\&= 60 - 0.04P\end{aligned}$$

$$0.1P + 60 - 0.04P = 85$$

$$0.06P + 60 = 85$$

$$0.06P = 25$$

$$P = \$416.67$$