

Name:

MATH 1513 – College Algebra
Study Guide

Instructions: Work neatly. Circle your final answers. Show all work.

1. Consider the general linear equation $Ax + By = C$ where A , B , and C are constants. The solution set for this equation can be represented by a line in the Cartesian plane.

a.) Determine the coordinates of the y-intercept of the line.

b.) Determine the coordinates of the x-intercept of the line.

2. Consider the linear equation $3x - 7y = 14$. Let L be the line that represents the solution set of this equation

a.) What are the coordinates of the y-intercept of L ?

b.) What are the coordinates of the x-intercept of L ?

c.) What is the slope of the line L ?

d.) Sketch a graph of the solution set L of the above equation with the x- and y-intercepts clearly labeled.

e.) Determine an equation for the line that is parallel to L and that passes through the point $(0, 0)$.

f.) Determine an equation for the line that is perpendicular to L and passes through the point $(0, 0)$.

3. Consider the circle described by the equation $(x - 2)^2 + (y + 3)^2 = 36$.

a.) What are the coordinates of the center of this circle?

b.) What is the length of the radius of this circle?

c.) What are the coordinates at which this circle crosses the **positive** x-axis? (Hint: What is the value of the y-coordinate along the x-axis?)

d.) What are the coordinates at which this circle crosses the **positive** y-axis? (Hint: What is the value of the x-coordinate along the y-axis?)

e.) Consider the line segment with endpoints located at the points found in parts (c) and (d). What is the length of this line segment?

f.) What are the coordinates of the midpoint of the line segment from part (e)?

4. Consider the functions $f(x) = 3x^2 - 4$ and $g(x) = \sqrt{x + 3}$.

a.) What is the domain of f ? What is the domain of g ?

b.) Find $(f + g)(x)$. What is the domain of the function $f + g$?

c.) Find $\left(\frac{f}{g}\right)(x)$. What is the domain of the function $\frac{f}{g}$?

d.) Find the composition, $(f \circ g)(x)$. What is the domain of the function $f \circ g$?

5. Solve the following inequalities and sketch a graph of the solution set.

a.) $3 < \frac{1}{3}x + 2 \leq 9$

b.) $|2x + 7| > 13$

6. Consider the piece-wise defined function

$$f(x) = \begin{cases} 2x - 5, & \text{for } x < -3 \\ 3x^3 + 2, & \text{for } -3 \leq x \leq 0 \\ -x - 12, & \text{for } x > 0 \end{cases}$$

Determine the values of the following:

a.) $f(-4)$

b.) $f(-3)$

c.) $f(-2)$

d.) $f(0)$

e.) $f(1)$

7. Recall the definition of the difference quotient,

$$\frac{f(x+h) - f(x)}{h}$$

where h is some constant. Determine the difference quotient for the function $f(x) = 3x^2 - 4$.

8. Solve the following quadratic equations.

a.) $4(x - 1)^2 = 9$

b.) $2x^2 + 8 = 0$

c.) $3x^2 - 8x + 9 = 0$

9. Solve the following equations.

a.) $\frac{2x}{x+7} = \frac{5}{x+1}$

b.) $\sqrt{x+3} - 2 = 1$

c.) $\sqrt{6x+7} = x+2$

10. Consider the polynomial function $f(x) = x^3 + 5x^2 - 2x - 10$.

a.) List the possible rational zeroes for this polynomial.

b.) Is $(x - 5)$ a factor of $f(x)$?

c.) Is $(x + 5)$ a factor of $f(x)$?

d.) Determine all zeroes of $f(x)$.

e.) Write $f(x)$ as a product of its linear factors.

11. Solve the following equations.

a.) $\log_3 27 = 2x - 1$

b.) $e^x + e^{-x} = 3$

c.) $\log(2x + 3) - \log(x + 1) + \log(x) = 1$