

**Review Test #1 – Chapters 1& 2 & Section 3.1**

To prepare for the test, you should study the following:

- Quiz #1
- Handout Review Chapter 1: # 1, 2, 3, 4, 5, 6, 9, 11
- Handout 2.3 Functions: # 4, 5, 6, 9, 10, 11
- Handout Sections 2.4 & 2.5 # 1 – 8
- Handout Section 2.6: The graphs of all basic functions
- Handout 2.7: All examples and exercises
- Homework Chapter 1: Section 1.4
- Homework Chapter 2: All exercises from homework sheet
- Homework Section 3.1: All exercises from homework sheet
- Handout Section 3.1 – Quadratic Functions – All exercises ( see website for handout and solutions)

**More applications**

1) Let  $A(-7, -4)$  and  $B(4, -1)$  be two points in a plane. Find the following and sketch an appropriate figure:

- a) An equation of the circle with diameter  $AB$ . Show how you obtain the equation.
- b) Does the equation from (a) represent  $y$  as a function of  $x$ ? Explain.
- c) Find the exact  $x$ - and  $y$ -intercepts (if any).
- d) Find the equation of the line  $AB$ .
- e) Does the equation from (d) represent  $y$  as a function of  $x$ ? Explain. Find the domain and range of the relation.

2) Sketch the graph of the following piece-defined functions. Show all work.

$$f(x) = \begin{cases} x+1, & -2 \leq x < 0 \\ \sqrt{x}, & 0 \leq x \leq 1 \\ x^3, & 1 < x < 2 \end{cases} \quad f(x) = \begin{cases} 2, & \text{if } x < -3 \\ -2x+1, & \text{if } -3 \leq x \leq 2 \\ x-2, & \text{if } 2 < x < 6 \end{cases} \quad f(x) = \begin{cases} x-x^2 & \text{if } x \leq 0 \\ x^2-x & \text{if } x > 0 \end{cases}$$

- a) What is the domain and range of each function?
- b) Find  $f\left(\frac{1}{2}\right)$ ,  $f\left(-\frac{1}{2}\right)$ , and  $f\left(\frac{3}{2}\right)$ .
- d) On what intervals is the function increasing, decreasing, constant?
- e) Calculate  $f(f(1))$ ,  $(f \circ f)(-1)$ , and  $(f \circ f)(0)$ .

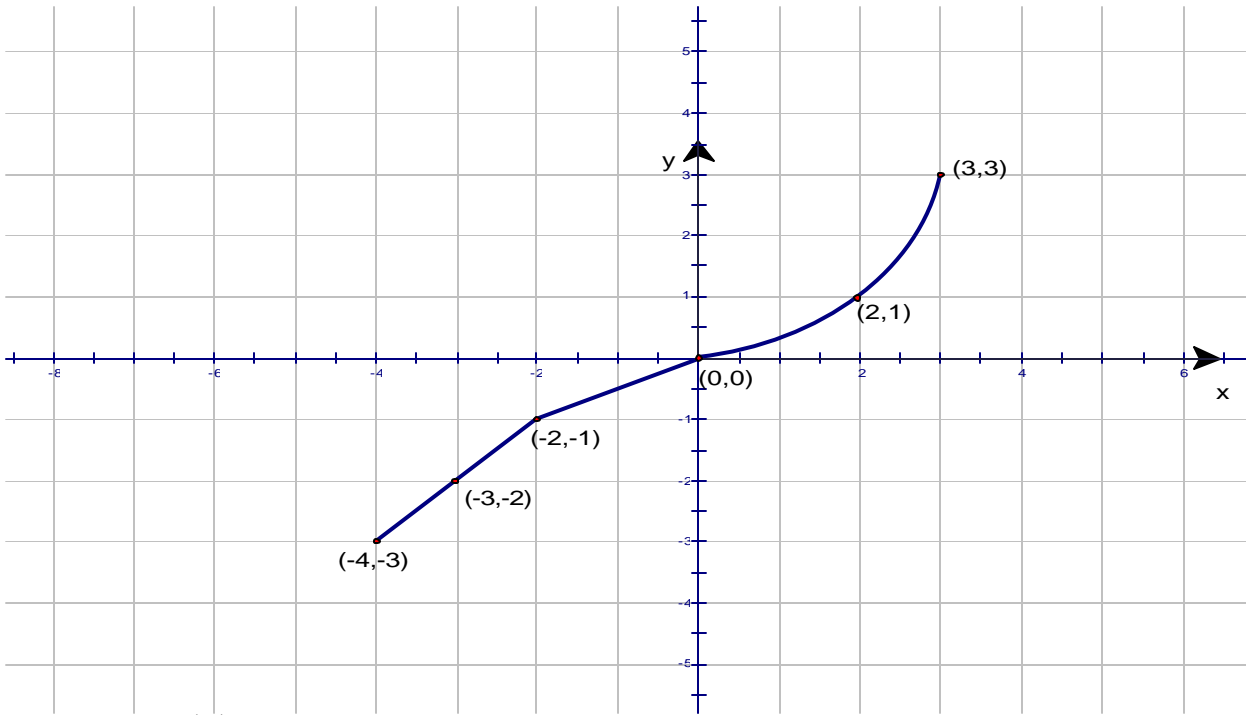
3) Let  $f(x) = \sqrt{x^2 + 16} - 5$ .

- a) What is the domain of this function? What is the range?
- b) Find  $f(0)$ .
- c) Find the  $x$ - and  $y$ -intercepts of the graph.

- 4)
  - a) Find an equation for the line perpendicular to and passing through the midpoint of the line segment joining  $(1, 3)$  and  $(5, -9)$
  - b) Find the intercepts of the line from part (a).
  - c) Find an equation for the circle whose diameter has endpoints  $(1, 3)$  and  $(5, -9)$ .

- 5)
  - a) Find the function that results from shifting  $f(x) = \frac{1}{x^2}$  eight units to the left and ten units down.
  - b) Sketch graphs for the basic root function  $f(x) = \sqrt[3]{x}$  and the transformation  $T(x) = 2 + 4\sqrt[3]{x+1}$  together in the same coordinate plane, showing coordinates of three points on each graph.

6)



Using the graph  $y = f(x)$  shown, answer the following:

- |  |                                  |
|--|----------------------------------|
| a) Is $y$ a function of $x$ ? Explain.       | g) Find $(f \circ f)(-3)$        |
| b) Find the domain and range of $f$ .        | h) Graph $y = f(x-2)$            |
| c) List the intercepts (as ordered pairs).   | i) Graph $y = f(x) - 2$          |
| d) Find $f(-2)$ .                            | j) Graph $y = f(-x)$             |
| e) For what values of $x$ does $f(x) = -3$ ? | k) If $f$ even, odd, or neither? |
| f) Solve $f(x) > 0$ .                        |                                  |

7) Let  $f$  represent a quadratic function whose graph is a concave up parabola with a vertex at  $(1, -1)$ , and an  $x$ -intercept at the origin.

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|-------------------------------------|---|
| a) Determine a formula for $f(x)$ . | c) Sketch a graph of $y = f(x)$ .             |
| b) Find all the $x$ -intercepts.    | d) Determine the domain and range of $f(x)$ . |

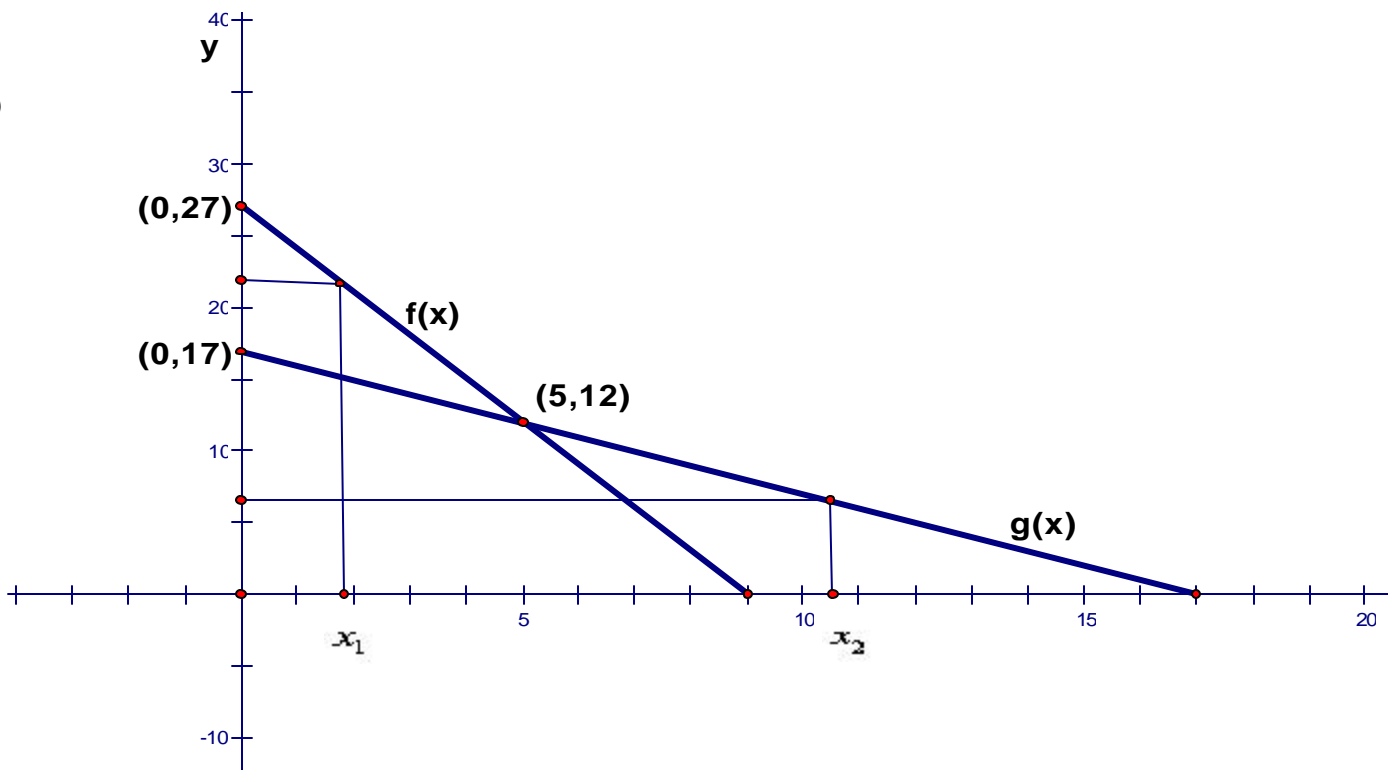
8) Suppose the height (in feet) of a ball thrown into the air is given by  $h(t) = 80t - 16t^2$ , where  $t$  is the time (in seconds) elapsed since throwing the ball.

- Evaluate and interpret  $h(2)$ .
- Solve the equation  $h(t) = 80$ . (Your solution(s) can be approximate.) Interpret your solution(s) and illustrate your answers in a graph of  $h(t)$ .

9) Let  $p(x) = 2x + 1$  and  $q(x) = x^2 - 3$  two functions.

- |   |  |
|---|--|
| a) graph both functions in the same coordinate plane. | b) Find a formula in terms of $x$ for $(p \circ q)(x)$ .                       |
| c) Find $p(q(-2))$ .                                  | d) Find and simplify $\frac{p(x+h) - p(x)}{h}$ and $\frac{q(x+h) - q(x)}{h}$ . |

10)



The graphs of two lines,  $f(x)$  and  $g(x)$  are shown in the figure. We can inscribe different rectangles underneath each line.

- Give formulas for  $f(x)$  and  $g(x)$ .
- Solve  $f(x) - g(x) = 4$  for  $x$ . Interpret the result geometrically; that is, illustrate the equation in the graph.
- Find formulas for the areas of the rectangles under  $f(x)$  and  $g(x)$ , and name them  $R(x)$  and  $S(x)$ , respectively.
- Define a new function  $D(x) = R(x) - S(x)$ . What information is given by  $D(x)$ ?
- Find the  $x$ -value for which  $D(x)$  is a maximum.

11) If a football player kicks a ball at an angle of  $37^\circ$  above the ground with an initial speed of 20 meters/second, then the height,  $h$ , as a function of the horizontal distance traveled,  $d$ , is given by:

$$h = 0.75d - 0.01914d^2.$$

- Sketch a graph of the path the ball follows.
- When the ball hits the ground, how far away is it from the spot where the football player kicked it?
- What is the maximum height the ball reached during its flight?
- What is the horizontal distance the ball has traveled when it reaches its maximum height?