

Math 150 Week-in-Review 3 Problem Set

1. Determine whether the following equations define functions (y as a function of x).

(a) $x^2 + y^2 = 16$

(b) $x^3y + 4y = 12$

(c) $y^3 - x = 1$

2. Find the domains of the following functions.

(a) $f(x) = \frac{x^3}{\sqrt{9-x}}$

(b) $f(x) = \frac{\sqrt[4]{x^2-6x-16}}{x^2+4x-21}$.

3. Consider the function:

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

(a) Graph the function.

(b) Find the domain and range.

(c) On what intervals is f increasing? decreasing?

4. A grocery store sells meat for \$2/lb for up to 10 lbs of meat. If you buy more than 10 lbs, you get the bulk price of \$1.50/lb. However, if you buy more than 30 pounds, you are charged an additional \$0.25/lb in handling costs for each additional pound over 30. Find a function which models the price P of meat as a function of the number of pounds bought, x .

5. Find the average rate of change for the following functions on the given interval.

(a) $f(x) = \sqrt{x+8}$ from $x = -4$ to $x = 1$

(b) $f(x) = x^2 + 2x - 4$ from $x = 0$ to $x = h$

(c) $f(x) = \frac{5}{x-4}$ from $x = a$ to $x = a + h$

6. A car is stopped at a red light. When the light turns green, the car takes off down a straight road. After 10 seconds, the car has gone 220 feet. After 15 seconds, the car has gone a total of 450 feet. After 30 seconds, the car has gone a total of 1500 feet.

(a) What was the car's average speed over the whole 30 seconds?

(b) What was the car's average speed from $t = 10$ to $t = 15$?

(c) What was the car's average speed during the last 15 seconds?

7. Graph the following functions by using transformations.

(a) $f(x) = 2|x + 1|$

(b) $f(x) = \sqrt{-2x} - 3$

(c) $f(x) = -(x - 3)^3$

(d) $f(x) = \frac{1}{2}(x^2 + 2)$

8. A function is given and the indicated transformations are applied to the graph in the given order. Write the resulting function $g(x)$.

(a) $f(x) = x^5$; shift 4 units to the left, stretch vertically by a factor of 3, and shift down 5 units.

(b) $f(x) = \sqrt[3]{x}$; stretch horizontally by a factor of 6, shift up 2 units, and reflect across the x -axis.

(c) $f(x)$ is any function; shrink horizontally by a factor of $\frac{1}{3}$, reflect across the y -axis, shrink vertically by a factor of $\frac{1}{8}$.

(d) $f(x)$ is any function; shift to the right 9 units, reflect across the x axis, shift down 7 units, stretch vertically by a factor of 2.

9. Determine whether the following functions are even, odd, or neither.

(a) $f(x) = x^3 - x$

(b) $f(x) = 10x^2 - 5x^{-4}$

(c) $f(x) = \sqrt[3]{x} + x^4$

10. Write the following quadratic functions in standard form, find the vertex of the parabola, the x and y intercepts, and find the minimum or maximum value.

(a) $f(x) = -3x^2 - 18x - 22$

(b) $f(x) = 5x^2 - 40x + 78$

11. Find the maximum or minimum of the following quadratic functions (without writing in standard form), find the intervals where the function is increasing and decreasing, and find the range of the parabola.

(a) $f(x) = 5x^2 + 6x + 4$

(b) $f(x) = -3x^2 + 8x - 2$

12. Find the equation of a parabola with minimum value $f(5) = -8$ and where one of the x -intercepts is $5 + \sqrt{2}$.