1-2 Notes Properties & Function Families   Name _____
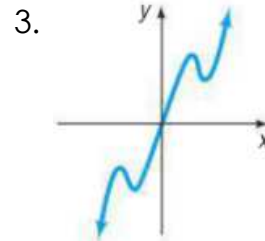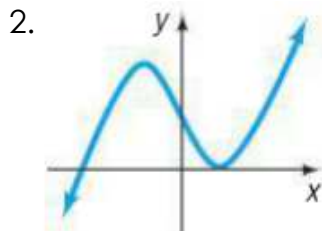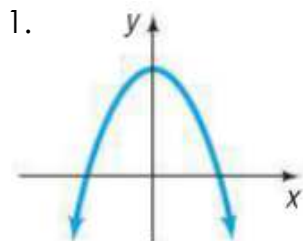Pre-Calculus

I. Even & Odd Functions
   A function is **even** when its graph is symmetric to the y-axis. When the point (x , y) is on the graph, the point (-x , y) is also on the graph.   **f(-x) = f(x)**
   A function is **odd** when its graph is symmetric to the origin. When the point (x , y) is on the graph, the point (-x , -y) is also on the graph.   **f(-x) = -f(x)**
      Identify if the function is even, odd or neither.

1.   2.   3.

4. $f(x) = x^2 - 5$ 5. $g(x) = x^3 - 1$ 6. $h(x) = 5x^3 - x$

II. Increasing, Decreasing, or Constant
   Increasing – slope is positive
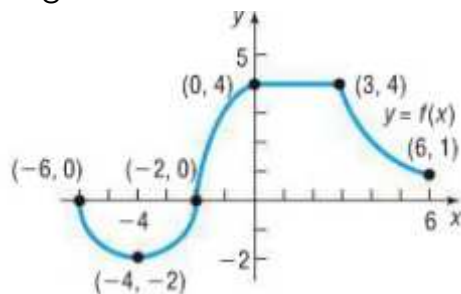   Decreasing – slope is negative
   Constant – slope is zero, not increasing or decreasing
   7. Determine where the function is increasing, decreasing, or constant.
      a) Increasing:

      b) Decreasing:

      c) Constant:

III. Maximum and Minimum
   Extreme Value Theorem – If f is a continuous function whose domain is a closed interval [a, b], then f has an absolute maximum and an absolute minimum on [a, b]. Absolute max/min can occur at endpoints.
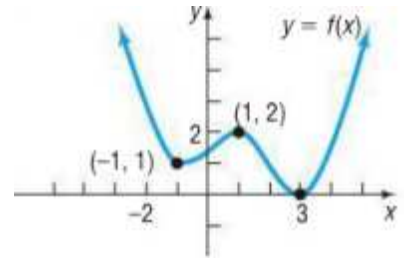   A local/relative maximum is the highest point on a given open interval.
      A local/relative minimum is the lowest point on a given open interval.

8. Determine the local extrema.
   a) At what value of x does f have a local maximum?
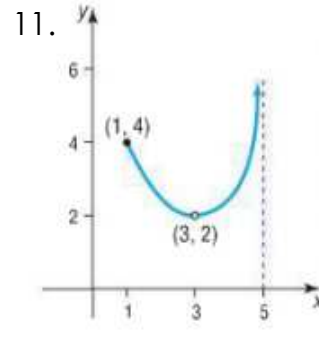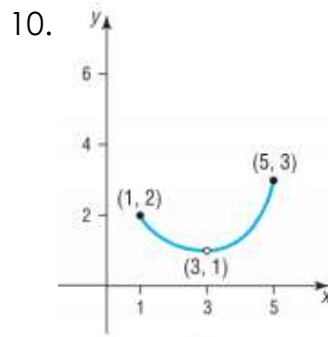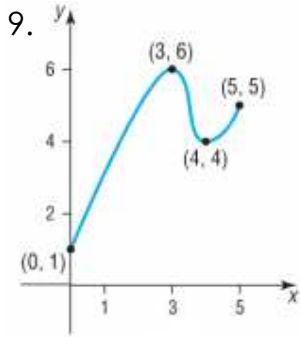   List the local maximum values.

   b) At what value of x does f have a local minimum?
      List the local maximum values.

   c) Find where f is increasing.

   d) Find where f is decreasing.

Find the absolute extrema.

9.

10.

11.

12. Use a graphing utility to find the relative extrema for $f(x) = 6x^3 - 12x + 5$ on the open interval $-2 < x < 2$.

IV. Average Rate of Change

$$Average\ rate\ of\ change\ = \frac{\Delta y}{\Delta x} = \frac{f(b) - f(a)}{b - a} = m_{sec}$$

> When a function is graphed and the average rate of change is calculated, graphically a line drawn between f(a) and f(b) is called a secant line.

13. Find the average rate of change of $f(x) = 3x^2$ on the given interval.
   a) from 1 to 3   b) from 1 to 5