

**Worksheet 56 - Polynomials**

1. Using a window of  $[-1, 1]$  by  $[-1, 1]$ , graph the odd-degree polynomial functions  $y = x$ ,  $y = x^3$ ,  $y = x^5$ . Describe the behavior of these functions relative to each other and predict the behavior of the graph of  $y = x^7$ . Check by graphing.

2. Using a window of  $[-1, 1]$  by  $[-1, 1]$ , graph the even-degree polynomial functions  $y = x^2$ ,  $y = x^4$ ,  $y = x^6$ . Describe the behavior of these functions relative to each other and predict the behavior of the graph of  $y = x^8$ . Check by graphing.

3. For each function below, state if it is a polynomial or give a reason why it is not.

(a)  $y = \pi x^4 - \sqrt{2}x^3 + e^2$

(b)  $y = 3x^3 + \sqrt[3]{x^3}$

(c)  $y = x^2 - 5 + 2x^{-1}$

(d)  $y = \frac{7(x+2)}{x+2}$

(e)  $y = -0.37x^{103} + \ln(4)x^{10}$

(f)  $y = 5x^{7/4} - x^{1/2} + 10$

4. It is not apparent from the standard viewing window whether the graph of the quadratic function  $y = x^2 - 4.25x + 4.515$  intersects the  $x$ -axis once, twice, or not at all. This is an example of hidden behavior. Experiment with various windows to determine the number of  $x$ -intercepts. If there are  $x$ -intercepts give their values to the nearest hundredth.

5. Use an end behavior diagram to describe the end behavior of each polynomial. Then verify using your calculator.

(a)  $P(x) = -\pi x^5 + 3x^2 - 1$

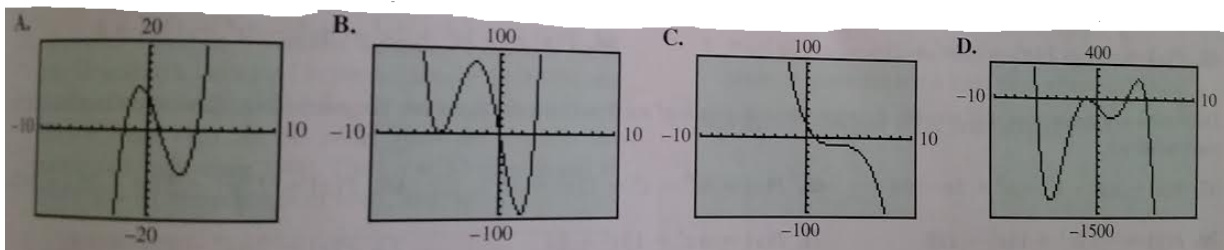
(b)  $P(x) = \sqrt{6}x^6 - 2x^5 - x^8 + 10$

(c)  $P(x) = 12x^{107,499}$

6. Without graphing, match the functions to their graphs.

$$f(x) = x^3 - 3x^2 - 6x + 8 \qquad g(x) = x^4 + 7x^3 - 5x^2 - 75x$$

$$h(x) = -x^3 + 9x^2 - 27x + 17 \qquad k(x) = -x^5 + 36x^3 - 22x^2 - 147x - 90$$



7. Without graphing, answer true or false to each statement and justify.

(a) The function defined by  $f(x) = x^3 + 2x^2 - 4x + 3$  has four real zeros.

(b) The function defined by  $f(x) = x^3 + 3x^2 + 3x + 1$  has at least one real zero.

(c) If a polynomial function of even degree has a negative leading coefficient and a positive  $y$ -intercept, then it must have at least two real zeros.

(d) The function defined by  $f(x) = 3x^4 + 5$  has no real zeros.

(e) The graph of  $f(x) = x^3 - 3x^2 + 3x - 1 = (x - 1)^3$  has exactly one  $x$ -intercept.

(f) An even-degree polynomial function must have at least one real zero.