1. Ture or false: The x-intercept of a function $y = f(x)$ are the real solutions of the equation $f(x) = 0$.

2. Determine whether the function $f(x) = 2(x-5)^3(x^2+5)$ is a polynomial function. If it is identify the degree.

3. If r is a real zero of even multiplicity of a function $f(x)$, then the graph of f _____ the axis at $x = r$.

4. The graph of the function $f(x) = 2x^4 + x^3 - 5x^2 - 3x + 4$ will behave like the graph of _____ for large values of $|x|$.

5. Explain what the notation $\lim_{x \to \infty} f(x) = -\infty$ means. Then provide an example of a function f for which $\lim_{x \to \infty} f(x) = -\infty$.

6. Construct a polynomial function that has degree three, with zeros of -4 with multiplicity 2, and 3 with multiplicity 1, and goes to $-\infty$ as $x \to \infty$.

7. Form two different polynomials with the following characteristics.

   (a) Roots at -2, 0, 4
   (b) Passes through the x-axis at only two of the roots
   (c) Has 4 turning points
   (d) Goes to $-\infty$ as $x \to \infty$

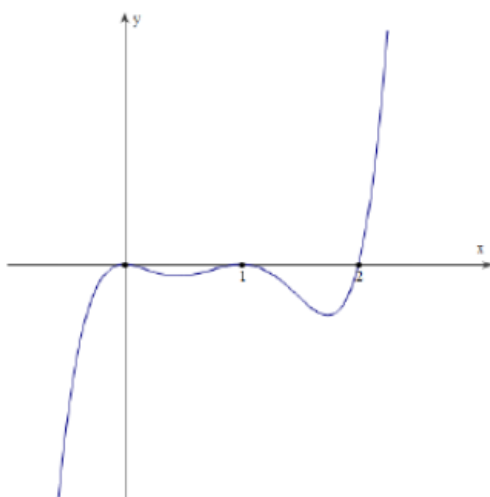8. Sketch the graph of the following polynomial using the method described.

$$P(x) = x^2(2x-4)(x^2+1)$$

   (a) Find all of the roots of $P(x)$ with multiplicity.
   (b) Determine whether the graph of $P(x)$ crosses or touches the x-axis at each root.
   (c) Determine the end behavior of $P(x)$.
   (d) Determine the behavior of the graph at each of the roots.
   (e) Sketch the graph.

9. Let $Q(x) = (x-2)^2(x+1)(x-5)$.

   (a) Determine the x-intercepts of $Q(x)$.
   (b) Determine the x-intercepts of $Q(x+2)$.
   (c) Using transformations, determine the x-intercepts of $3Q(x-1)$
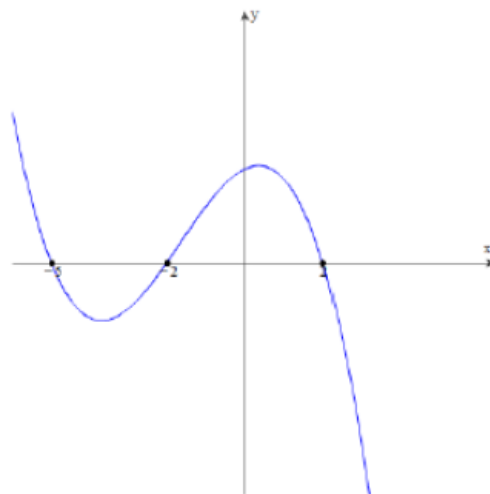   (d) Find the y-intercept of $2Q(x) + 3$.

10. Can this graph be the graph of a polynomial function? Justify your answer.

11. For each given graph, write the equation of a function $f(x)$ that may have it as its graph.

a)

b)