Math 140: Week-in-Review 8 (Chapter 5.2)

1. Determine if the given function is a polynomial function. If the answer is yes, state the degree, leading term, leading coefficient, and constant term.

   (a) $f(x) = 5x^{-1} - 7^x + 12x^{2.6}$

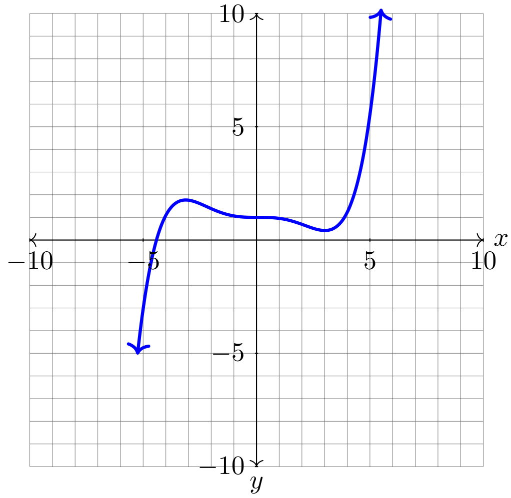
   (b) $g(r) = 9^8 + \sqrt[3]{10}\, r^2 - 4r^3 + \dfrac{3}{4}r$

2. Describe the end behavior of each polynomial function. Draw a quick sketch of the end behavior.

   (a) $f(x) = -23x^6 + 50x^3 - 7x + 1045$

   (b) $g(x) = 15x^4 - 19 + 3x^9 - 6x^2$

3. Describe the end behavior symbolically for the polynomial function, $f(x)$, graphed below.



4. State the domain of each polynomial function.

(a) $h(x) = 6x^{15} + 9x^2 - 30x$

(b) $g(r) = 15r^3 - r^4 + 5r^2 - 120$

5. Determine all exact real zeros, the x-intercept(s), and y-intercept of each given polynomial function, if possible.

   (a) $f(x) = 7(3x + 4)(7 - 5x)$

   (b) $g(x) = 10x^3 + 15x^2 - 30x = 5x(2x + 3)(x - 2)$

   (c) $h(r) = 5r^2 - r^3 + 4r - 20$

   (d) $k(x) = (x^2 + 5)(x^2 - 9)$

6. Determine the vertex, axis of symmetry, domain, range, x-intercept(s), y-intercept, maximum value and minimum value for each quadratic function, if they exist.

   (a) $f(x) = 3x^2 + 9x$

   (b) $g(x) = 4x^2 - 3x + 1$

(c) $h(x) = 16 - 25x^2$

(d) $j(x) = 5x^2 - \frac{17}{2}x + \frac{3}{2}$

(e) $k(x) = 4x^2 - 20x + 25$

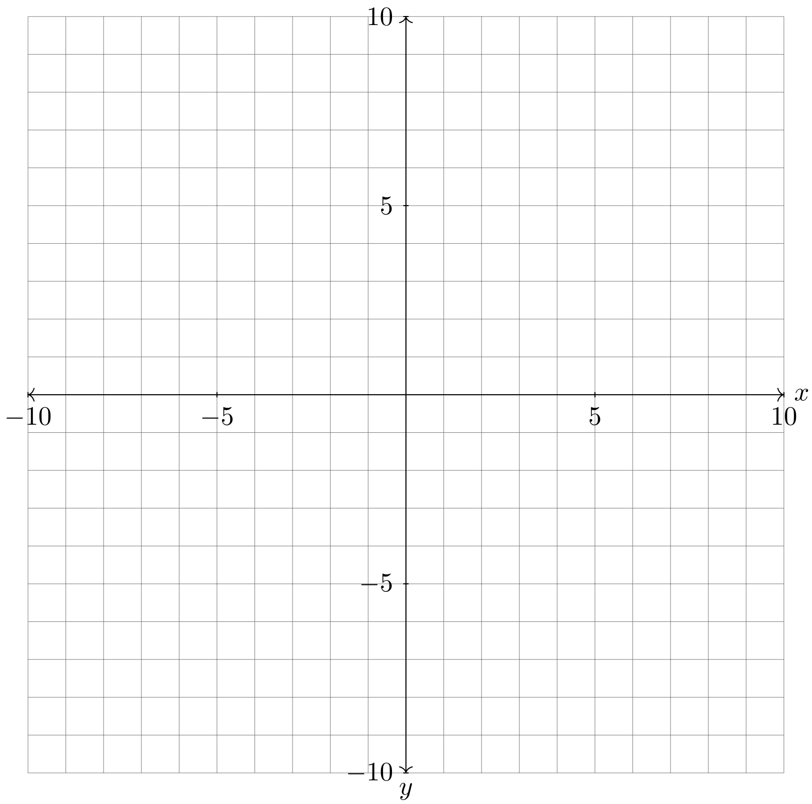
(f) Graph the quadratic function with the following properties

i. As $x \to -\infty$, $f(x) \to -\infty$ and as $x \to \infty$, $h(x) \to -\infty$

ii. $f(x)$ has real zeros at $x = -1,\ 5$.

iii. There is a maximum value of 9.

iv. The graph has a y-intercept of $(0, 5)$.



7. Use the given revenue function, $R(x)$, and cost function, $C(x)$, where x is the number of items made and sold, to determine each of the following. Assume both revenue and cost are given in dollars.

   i. The number of items sold when revenue is maximized.
   ii. The maximum revenue.
   iii. The number of items sold when profit is maximized.
   iv. The maximum profit.
   v. The break-even quantity/quantities.

   (a) $R(x) = -0.5x^2 + 100x$ and $C(x) = 40x + 1600$

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i. The number of items sold when revenue is maximized.
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iii. The number of items sold when profit is maximized.
iv. The maximum profit.
v. The break-even quantity/quantities.

(b) $R(x) = -4x^2 + 300x$ and $C(x) = 28x + 500$

8. The demand function for a calculator is given by $p(x) = -\frac{1}{20}x + 100$ where $p(x)$ is the price in dollars. The fixed costs are \$1,280 and the variable costs are \$80 per calculator made.

   (a) Determine the cost, revenue and profit as functions of the number of calculators made and sold.

   (b) How many calculators must be sold to maximize profit?

   (c) What is the maximum profit?

9. The cost of manufacturing collectible bobble head figurines is given by $C(x) = 30x + 350$, where x is the number of collectible bobble head figurines produced. If each figurine has a price-demand function of $p(x) = -1.2x + 360$, in dollars, determine

   (a) the company's profit function.

   (b) how many figurines must be sold in order to maximize revenue?

   (c) how many figurines must be sold in order to maximize profit?

   (d) at what price per figurine will the maximum profit be achieved?