1. Consider the parabola given by $f(x) = 7x^2 + 10x - 23$.

   (a) What is the vertex of the parabola?

   (b) Does the parabola open up or down?

   (c) What is the maximum or minimum value of the parabola?

   (d) What is the axis of symmetry?

   (e) Determine the x-intercept(s).

   (f) Determine the y-intercept.

   (g) Sketch a graph of the parabola.

   (h) What are the domain and range of the function?

2. The monthly profit for a small company that makes long-sleeve T-shirts depends on the price per shirt. If the price is too high, sales will drop. If the price is too low, the revenue brought in may not cover the cost to produce the shirts. After months of data collection, the sales team determines that the monthly profit is approximated by $f(p) = -50p^2 + 1700p - 12000$, where p is the price per shirt and $f(p)$ is the monthly profit based on the price.

   (a) Find the price that generates the maximum profit.

   (b) Find the maximum profit.

   (c) Find the price(s) that would enable the company to break even.

3. Describe the end behavior of the polynomial function

   (a) $f(x) = 9x^4 + 129x^3 + 201x^2 + 645x + 780$

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

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

4. Sketch a graph of the function

(a) $g(x) = x^3 + 6x^2 + 5x$

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

5. For each of (A)-(F) select the appropriate graph (I)-(VI) and give reasons why.

(A) ___ $f(x) = 2(x-4)^2(x+1)^3$

(B) ___ $g(x) = 8(x-4)^3(x+1)$

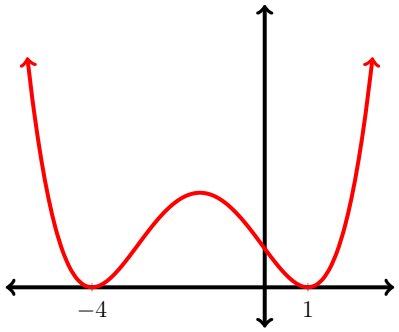
(C) ___ $h(x) = -5(x-4)^3(x+1)^2$

(D) ___ $p(x) = -3(x+4)^2(x-1)^3$

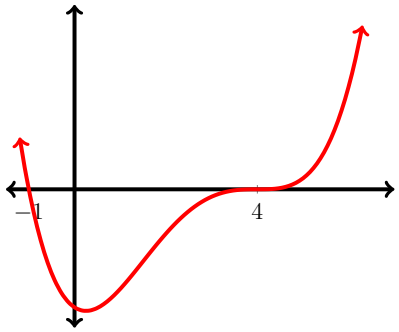
(E) ___ $q(x) = 7(x+4)^3(x-1)^2$

(F) ___ $r(x) = 6(x+4)^2(x-1)^2$

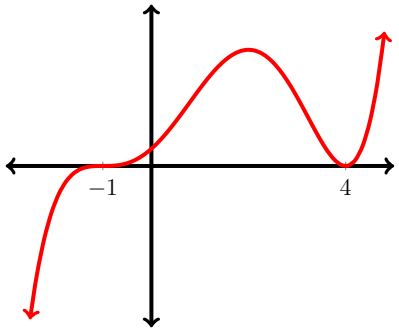
(I)



(II)



(III)



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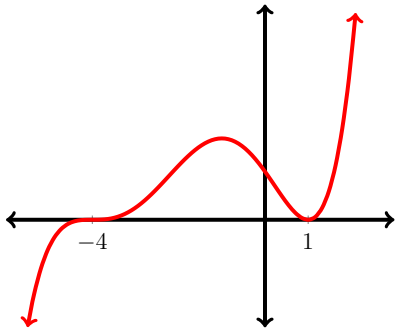
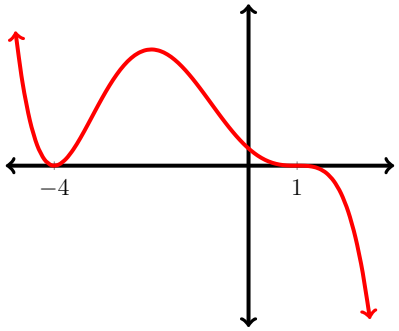
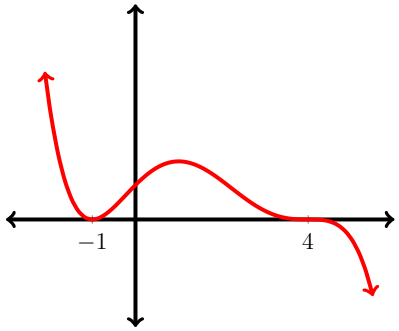


(V)



(VI)



6. Use polynomial long division or synthetic division to write $\frac{f(x)}{g(x)} = q(x) + \frac{r(x)}{g(x)}$. That is, find the quotient and the remainder.

(a) $\dfrac{-3x^5 - 10x^3 + x^2 - x}{x^3 + 5}$

(b) $\dfrac{2x^4 + 37x^3 + 33x^2 - 2x}{x + 1}$

7. Given the polynomial $9x^3 + 6x^2 - 5x - 2$ which of the following are linear factors of the polynomial?

(A) $x - 1$

(B) $x + 1$

(C) x

(D) $x - 2$

(E) $x - \frac{2}{3}$

(F) $x - \frac{5}{13}$

8. What are the rational roots of the function $p(x) = 2x^4 + x^3 + 9x^2 + 5x - 5$?

9. Completely factor the polynomial $2x^3 - 15x^2 + 6x + 7$.

10. Find all roots of the polynomial $S(x) = 4x^3 - 5x^2 - 3x + 1$.

11. If $f(x) = -3x^4 + x^3 - 6x^2 + 3x + 9$ and $i\sqrt{3}$ is a root of f, find all roots of f.

12. What are the vertical asymptote(s) of $h(x) = \dfrac{x+2}{3x^2+4x+1}$?

13. What are the horizontal asymptote(s) of $h(x) = \dfrac{x+2}{3x^2+4x+1}$?

14. Sketch a graph of the function

    (a) $f(x) = \dfrac{5x-1}{8x+3}$

(b) $g(x) = \dfrac{2}{x^2 + 1}$

(c) $h(x) = \dfrac{3x^3}{x^2 + 7x - 18}$

15. Solve the inequality $2x^2 \geq 1 - x$

16. Solve the inequality $\dfrac{x+7}{x-3} < 0$.

17. For each Section in Chapter 3, write down the key terms and ideas.

(a) Section 3.1:

(b) Section 3.2:

(c) Section 3.3:

(d) Section 3.4:

(e) Section 3.5:

(f) Section 3.6: