Chapter 4 Review Extra Practice

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1. For each of the following functions, determine algebraically:
- **i.** the intervals where the function is increasing
- **ii.** the intervals where the function is decreasing
- **iii.** the x-coordinates of the points where the tangent to the function is horizontal

a. $f(x) = x^3 - x + \frac{5}{2}$

b. $f(x) = x + \frac{9}{x}$

c. $f(x) = x^5 + 1$

2. For each function, find the critical numbers. Then, use the first derivative test to determine whether the point corresponding to the critical number is a local maximum, a local minimum, or neither.

a. $f(x) = 1 - 6x^2$

b. $f(x) = 3x^3 + 3x^2 + 3x + 3$

c. $f(x) = \frac{4x^3}{x^2 - 8}$

3. For each of the following functions, determine the equations of any vertical asymptotes and horizontal asymptotes.

a. $f(x) = \frac{x + 2}{x - 2}$

b. $f(x) = \frac{x}{x^2 - 11x}$

c. $f(x) = \frac{3x^2 + 10}{x^2 - 16}$

d. $f(x) = \frac{x^3 - 7}{6x^2}$

e. $f(x) = \frac{x^3 - 64}{2x^2 - 3x - 20}$

4. Determine the critical numbers for each of the following, and use the second derivative test to decide if the corresponding point is a local maximum, a local minimum, or neither.

a. $f(x) = (x + 6)(x + 4)$

b. $f(x) = x^3 + \frac{1}{2}x^2 - 5x - 4$

c. $f(x) = \frac{5}{x^2 - 4}$

d. $f(x) = x - \frac{100}{x}$

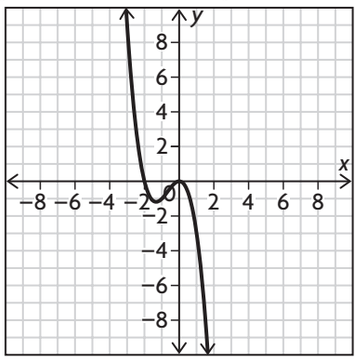
5. Use the algorithm for curve sketching to sketch the graph of each of the following functions.

a. $f(x) = x^4 - x^3 - x^2$

b. $f(x) = \frac{1}{x^2 - 9x}$

c. $f(x) = x^2 - \frac{1}{5}x^4$

6. The following graph represents the second derivative, $f''(x)$, of a function $f(x)$.



a. On which intervals is the graph of $f(x)$ concave up, and on which is the graph concave down?

b. List the x-coordinates of any points of inflection.

c. Make a rough sketch of a possible graph of $f(x)$.