3.6 Curve Sketching: Using Derivatives in Graphing & Concavity & the Second Derivative

Analyze and sketch the graph. Include intercepts, asymptotes, increasing and decreasing behaviors, and critical points. Find the intervals on which the graph of f is concave upward and concave downward, and find the inflection points of the graph. Then, sketch the graph distinguishing between the concave-upward and concave-downward parts.

25. $f(x) = x^3 - 3x^2 + 3$
2. $f(x) = 8x^2 - x^4$
17. $y = \dfrac{x^2 - 6x + 12}{x - 4}$
11. $f(x) = \dfrac{2x}{x^2 - 1}$
7. $g(x) = \dfrac{x^2}{x^2 + 3}$
41. $h(x) = 2x - \tan x \qquad -\dfrac{\pi}{2} < x < \dfrac{\pi}{2}$

Find and classify the relative extrema of f if there are any. You need not graph f.

7. $f(x) = \dfrac{3 - x}{1 + x}$ 8. $f(x) = \dfrac{x + 1}{x - 1}$ 9. $f(x) = \dfrac{x^2}{x + 1}$ 10. $f(x) = \dfrac{x}{x^2 + 1}$

Create a function whose graph has the given characteristics.

67. Vertical asymptote: x=5 and Horizontal asymptote: y=0

68. Vertical asymptote: $x = 2, x = -2$ and Horizontal asymptote: y=3

Use the second-derivative test to find the relative maxima and relative minima of g.

13. $g(x) = x + \dfrac{2}{\sqrt{x}}$ 14. $g(x) = \dfrac{x^3 + 4}{x^2}$