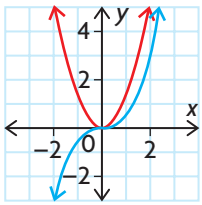
Chapter 2 Test



1. Explain when you need to use the chain rule.
2. The graphs of a function and its derivative are shown at the left. Label the graphs f and f', and write a short paragraph stating the criteria you used to make your selection.
3. Use the definition of the derivative to find $\frac{d}{dx}(x - x^2)$.
4. Determine $\frac{dy}{dx}$ for each of the following functions:
   a. $y = \frac{1}{3}x^3 - 3x^{-5} + 4\pi$
   b. $y = 6(2x - 9)^5$
   c. $y = \frac{2}{\sqrt{x}} + \frac{x}{\sqrt{3}} + 6\sqrt[3]{x}$
   d. $y = \left(\frac{x^2 + 6}{3x + 4}\right)^5$ (Leave your answer in a simplified factored form.)
   e. $y = x^2\sqrt[3]{6x^2 - 7}$ (Simplify your answer.)
   f. $y = \frac{4x^5 - 5x^4 + 6x - 2}{x^4}$ (Simplify your answer.)
5. Determine the slope of the tangent to the graph of $y = (x^2 + 3x - 2)(7 - 3x)$ at $(1, 8)$.
6. Determine $\frac{dy}{dx}$ at $x = -2$ for $y = 3u^2 + 2u$ and $u = \sqrt{x^2 + 5}$.
7. Determine the equation of the tangent to $y = (3x^{-2} - 2x^3)^5$ at $(1, 1)$.
8. The amount of pollution in a certain lake is $P(t) = (t^{\frac{1}{4}} + 3)^3$, where t is measured in years and P is measured in parts per million (ppm). At what rate is the amount of pollution changing after 16 years?
9. At what point on the curve $y = x^4$ does the normal have a slope of 16?
10. Determine the points on the curve $y = x^3 - x^2 - x + 1$ where the tangent is horizontal.
11. For what values of a and b will the parabola $y = x^2 + ax + b$ be tangent to the curve $y = x^3$ at point $(1, 1)$?