Chapter 2 Review Extra Practice

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1. Use the definition of the derivative to determine $f'(x)$ for each of the following functions.

a. $f(x) = 3x + 2$

b. $f(x) = x^2 + 2x - 1$

c. $f(x) = \sqrt{x + 1}$

2. Differentiate each of the following functions.

a. $f(x) = 6x^2 + 3x - 1$

b. $f(x) = 2\sqrt{x^2 + 1}$

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

d. $f(x) = (5x^2 + 1)^3$

e. $f(x) = \dfrac{2x + 3}{x - 1}$

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

3. Determine the derivative of the given function.

a. $f(x) = \dfrac{1}{\sqrt{x}}$

b. $f(x) = \dfrac{x}{x^3 - 1}$

c. $f(x) = (x + 4)(x^2 + 3x + 2)$

d. $f(x) = (3x^2 + x - 1)^4$

e. $f(x) = \dfrac{x + \pi}{2x - \pi}$

f. $f(x) = (x - 1)^3(x - 4)^2$

4. Determine the slope of the tangent line to the curve at the given value of x.

a. $f(x) = 5x^2 + x^3 - 2x, x = 1$

b. $f(x) = (x + 2)^3(x - 4)^2, x = 0$

c. $f(x) = \sqrt{x^2 + x + 2}, x = 1$

d. $f(x) = 4 - \dfrac{3}{2}x, x = 7$

e. $f(x) = \left(\dfrac{2x + 1}{x + 2}\right)^3, x = 0$

f. $f(x) = \dfrac{x^2 + 3}{2 - x}, x = 1$

5. If f is a differentiable function, find an expression for the derivative of each of the following functions.

a. $g(x) = f(x^2 + 1)$

b. $g(x) = (x + 1)f(3x)$

6. Use the chain rule, in Leibniz notation, to determine $\frac{dy}{dx}$ at the given value of x.

a. $y = 3u^2 + 1, u = x^2 + 1, x = -1$

b. $y = u + \sqrt{u}, u = x - 2, x = 4$

c. $y = (u + 1)^3, u = (x + 1)^2, x = 0$

d. $y = \dfrac{1}{u + 1}, u = \dfrac{1}{x}, x = 1$

7. Determine the slope of the tangent to the curve $y = \sqrt{(1 + x)^3}$ at (3, 8).

8. Determine the value(s) of x where the graph of each function has a horizontal tangent.

a. $f(x) = (x - 1)^2(x + 3)^2$

b. $f(x) = \sqrt{x^2 + 4x - 2}$

9. Determine the equation of the normal to $y = x^3 + x - 1$ at (1, 1).

10. Determine the equation of the tangent to $y = x(2x + 1)^3$ when $x = 1$.