Section 3.1

1. Use the limit definition to find the derivative of the function.

   (a) $f(x) = -5x + 3$

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

   (c) $f(x) = \sqrt{x+2}$

   (d) $f(x) = \frac{1}{x+2}$

2. Using the definition of the derivative, find the slope of the tangent line for the given point. Then find the equation of the tangent line for the given point.

   (a) $f(x) = 2x^2 - 1$; $(0, -1)$

   (b) $f(x) = \sqrt{x+3}$; $(6, 3)$

3. Using the definition of the derivative or the limit definition of the derivative at a point, find the derivative at the indicated point.

   (a) $f(x) = 2x + 4$; $(1, 6)$

   (b) $f(x) = x^2 - 2$; $(2, 2)$

Section 3.2

4. Using the derivative rules, find the derivative of the functions

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

   (b) $f(x) = 4\sqrt[3]{x} + 4x^{-2}$

   (c) $f(x) = -\frac{1}{2}x(1 + x^2)$

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

   (e) $f(x) = 4e^x + 2x^9$

5. Find $f'(x), f''(x), f^{iii}(x)$

   (a) $f(x) = 20x^3 - 36x^2$

   (b) $f(x) = \sqrt[5]{x^3}$

Section 3.3

6. Find the derivative of the functions

   (a) $f(x) = \frac{3-2x-x^2}{x^2-1}$

   (b) $f(x) = (x^5 + 4x^2)(8x^2 - 2x + 9)$

   (c) $f(x) = \left(\frac{x+5}{x-1}\right)(2x+1)$

   (d) $f(x) = x^2e^{-x} - 4e^{2x}$

Section 3.4

7. Find the limits

   (a) $\lim_{x\to 0} \frac{\cos^2(x)-1}{x}$

   (b) $\lim_{x\to -3} \frac{\sin(x+3)}{x^2+8x+15}$

8. Find the derivatives

   (a) $(x^2 - 4x)\tan(x)$

   (b) $-9\sin^5(x)$

   (c) $f(x) = \frac{(x^2-1)\sin(x)}{\sin(x)+1}$

   (d) $f(x) = \frac{2\sin(x)}{5-\cos(x)}$

   (e) $4\csc(x)$