Directions: Find the derivative of each of the following functions.

1. $f(x) = x^8 - x + 3$

$$f'(x) = \boxed{8x^7 - 1}$$

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

$$f'(x) = 5(-1)x^{-1-1} + 5x^4 = \boxed{-\frac{5}{x^2} + 5x^4}$$

3. $f(x) = \frac{1}{\sqrt{x}} \quad = \frac{1}{x^{1/2}} = x^{-1/2}$

$$f'(x) = -\frac{1}{2} x^{-\frac{1}{2}-1} = -\frac{1}{2} x^{-\frac{3}{2}} = \frac{-1}{2x^{3/2}} = \boxed{\frac{-1}{2\sqrt{x}^3}}$$

4. $f(x) = \sqrt{7x} \quad = \sqrt{7}\sqrt{x} = \sqrt{7} \, x^{\frac{1}{2}}$

$$f'(x) = \sqrt{7} \cdot \frac{1}{2} x^{\frac{1}{2}-1} = \frac{\sqrt{7}}{2} x^{-\frac{1}{2}} = \frac{\sqrt{7}}{2x^{1/2}}$$

$$= \boxed{\frac{\sqrt{7}}{2\sqrt{x}}}$$

Directions: Find the derivative of each of the following functions.

1. $f(x) = x^{-8} + x - 4$

$$f'(x) = -8x^{-8-1} + 1 = 1 - 8x^{-9} = \boxed{1 - \frac{8}{x^9}}$$

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

$$f'(x) = -5x^{-5-1} + 5x^{5-1} = -5x^{-6} + 5x^4 = \boxed{\frac{-5}{x^6} + 5x^4}$$

3. $f(x) = \sqrt[3]{x^2} = x^{2/3}$

$$f'(x) = \frac{2}{3}x^{2/3 - 1} = \frac{2}{3}x^{-1/3} = \frac{2}{3x^{1/3}} = \boxed{\frac{2}{3\sqrt[3]{x}}}$$

4. $f(x) = (7x)^2 = 49x^2$

$$f'(x) = 49 \cdot 2x = \boxed{98x}$$

Directions: Find the derivative of each of the following functions.

1. $f(x) = x^4 - 11x + 3$

$$\boxed{f'(x) = 4x^3 - 11}$$

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

$f'(x) = 5(-5)x^{-5-1} + \frac{1}{2}x^{\frac{1}{2}-1}$ $= -25x^{-6} + \frac{1}{2}x^{-\frac{1}{2}}$

$= -\frac{25}{x^6} + \frac{1}{2x^{\frac{1}{2}}}$ $= \boxed{-\frac{25}{x^6} + \frac{1}{2\sqrt{x}}}$

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

$f'(x) = \frac{7}{3}(-2)x^{-2-1} + 0 = -\frac{14}{3}x^{-3} = \boxed{-\frac{14}{3x^3}}$

4. $f(x) = \sqrt[3]{8x}$ $= \sqrt[3]{8}\sqrt[3]{x} = 2\sqrt[3]{x} = 2x^{\frac{1}{3}}$

$f'(x) = 2 \cdot \frac{1}{3}x^{\frac{1}{3}-1} = \frac{2}{3}x^{-\frac{2}{3}} = \frac{2}{3x^{2/3}} = \frac{2}{3\sqrt[3]{x}^2}$

Directions: Find the derivative of each of the following functions.

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

$$\boxed{f'(x) = 4 - 4x^3}$$

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

$$f'(x) = \frac{1}{5}(-1)x^{-1-1} + 5x^{5-1} = -\frac{1}{5}x^{-2} + 5x^4 = \boxed{-\frac{1}{5x^2} + 5x^4}$$

3. $f(x) = \sqrt[5]{x^4} \quad = x^{\frac{4}{5}}$

$$f'(x) = \frac{4}{5}x^{\frac{4}{5}-1} = \frac{4}{5}x^{-\frac{1}{5}} = \frac{4}{5}\frac{1}{x^{1/5}} = \boxed{\frac{4}{5\sqrt[5]{x}}}$$

4. $f(x) = \sqrt{4x} + \sqrt{2} \quad = \sqrt{4}\sqrt{x} + \sqrt{2} = 2\sqrt{x} + \sqrt{2}$

$$= 2x^{1/2} + \sqrt{2}$$

$$f'(x) = 2\frac{1}{2}x^{\frac{1}{2}-1} + 0 = x^{-\frac{1}{2}} = \frac{1}{x^{1/2}} = \boxed{\frac{1}{\sqrt{x}}}$$