

General Power Differentiation Rule ... Set 5

Derivative Power Rule Practice/Review Worksheet #2

Derivative Power Rule:

$$\frac{d}{dx} x^n = n * x^{n-1}$$

Power Rule Conditions:

- i) All Radicals converted to Rational Exponents
- ii) All denominator variables brought up to the numerator
- iii) All parentheses resolved, all terms expanded

Finding a Derivative In Exercises 3–24, use the rules of differentiation to find the derivative of the function.

1) $f(x) = 3x^5 - 4x + 156$

2) $f(x) = \frac{5}{3x^6}$

3) $g(x) = 3\sqrt{x^9}$

4) $f(x) = \frac{\sqrt{x^9}}{3}$

5) $h(t) = \frac{7}{5(2t)^3}$

6) $f(t) = \frac{7}{5(2t)^3}$

7) $f(x) = \frac{7}{x\sqrt{x}}$

8) $f(x) = 5\sqrt{x} - 3x^2(2 - 5x)$

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Answers

Finding a Derivative In Exercises 3–24, use the rules of differentiation to find the derivative of the function.

1) $f(x) = 3x^5 - 4x + 156$

$$f'(x) = 15x^4 - 4$$

2) $f(x) = \frac{5}{3x^6}$

$$f(x) = \frac{5}{3}x^{-6} \quad \left| \begin{array}{l} f'(x) = \frac{5}{3} \cdot -6x^{-7} \\ f'(x) = -\frac{30}{3}x^{-7} \end{array} \right. \quad \boxed{f'(x) = -\frac{10}{x^7}}$$

3) $g(x) = 3\sqrt{x^9}$

$$g(x) = 3x^{9/2} \quad \left| \begin{array}{l} g'(x) = \frac{27}{2}x^{7/2} \\ g'(x) = 3 \cdot \frac{9}{2}x^{7/2} \end{array} \right. \quad \boxed{g'(x) = \frac{27}{2}x^{7/2}}$$

4) $f(x) = \frac{\sqrt{x^9}}{3}$

$$f(x) = \frac{1}{3}x^{9/2} \quad \left| \begin{array}{l} f'(x) = \frac{1}{3} \cdot \frac{9}{2}x^{7/2} = \frac{3}{2}x^{7/2} \\ f'(x) = \frac{3}{2}x^{7/2} \end{array} \right. \quad \boxed{f'(x) = \frac{3}{2}x^{7/2}}$$

5) $h(t) = \frac{7}{5(2t)^3}$

$$h(t) = \frac{7}{5 \cdot 2^3 t^3} \quad \left| \begin{array}{l} h(t) = \frac{7}{40}t^{-3} \\ h'(t) = \frac{7}{40} \cdot -3t^{-4} \\ h'(t) = \frac{-21}{40t^4} \end{array} \right. \quad \boxed{h'(t) = \frac{-21}{40t^4}}$$

6) $f(t) = \frac{7}{(3t)^3}$

$$f(t) = \frac{7}{27t^3} \quad \left| \begin{array}{l} f'(t) = \frac{7}{27} \cdot -3t^{-4} \\ f'(t) = \frac{-21}{27}t^{-4} \\ f'(t) = \frac{-7}{9t^4} \end{array} \right. \quad \boxed{f'(t) = \frac{-7}{9t^4}}$$

7) $f(x) = \frac{7}{x\sqrt{x}}$

$$f(x) = \frac{7}{x \cdot x^{1/2}} \quad \left| \begin{array}{l} f(x) = 7x^{-3/2} \\ f'(x) = 7 \cdot -\frac{3}{2}x^{-5/2} \\ f'(x) = \frac{-21}{2x^{5/2}} \end{array} \right. \quad \boxed{f'(x) = \frac{-21}{2x^{5/2}}}$$

8) $f(x) = 5\sqrt{x} - 3x^2(2 - 5x)$

$$f(x) = 5x^{1/2} - 6x^2 + 15x^3$$

$$f'(x) = 5 \cdot \frac{1}{2}x^{-1/2} - 12x + 45x^2$$

$$\boxed{f'(x) = \frac{5}{2x^{1/2}} - 12x + 45x^2}$$

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Find the derivative of the functions below:

9) $f(x) = x(2 - 5x)^2$

10) $f(x) = \frac{5x^4 - 3x + 1}{x^2}$

11) $f(x) = \frac{3x^4 - 2x + 1}{\sqrt{x}}$

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

Finding an Equation of a Tangent Line In Exercises 53–56, (a) find an equation of the tangent line to the graph of f at the given point.

13) $f(x) = \frac{2}{4\sqrt{x^3}}$ $(1, 2)$

14) $y = (x - 2)(x^2 + 3x)$ $(1, -4)$

Equation of tangent line:

- i) Find ordered pair $((x_1, y_1))$ using $f(x)$
- ii) Find slope m using $f'(x)$
- iii) $y - y_1 = m(x - x_1)$

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Answers

Find the derivative of the functions below:

<p>9) $f(x) = x(2 - 5x)^2$</p> <p>$f(x) = x(2-5x)(2-5x)$</p> <p>$f(x) = x(4 - 20x + 25x^2)$</p> <p>$f(x) = 4x - 20x^2 + 25x^3$</p>	<p>10) $f(x) = \frac{5x^4 - 3x + 1}{x^2}$</p> <p>$f(x) = (5x^4 - 3x + 1)x^{-2}$</p> <p>$f(x) = 5x^2 - 3x^{-1} + x^{-2}$</p>
$f'(x) = 4 - 40 + 75x^2$	$f'(x) = 10x + 3x^{-2} - 2x^{-3}$ $f'(x) = 10x + \frac{3}{x^2} - \frac{2}{x^3}$

<p>11) $f(x) = \frac{3x^4 - 2x + 1}{\sqrt{x}}$</p> <p>$f(x) = (3x^4 - 2x + 1)x^{-1/2}$</p> <p>$f(x) = 3x^{7/2} - 2x^{1/2} + x^{-1/2}$</p> <p>$f'(x) = 3 \cdot \frac{7}{2}x^{5/2} - 2 \cdot \frac{1}{2}x^{-1/2} - \frac{1}{2}x^{-3/2}$</p>	<p>12) $f(x) = \frac{2x^3 - 4x^2 + 5}{\sqrt{x}}$</p> <p>$f(x) = (2x^3 - 4x^2 + 5)x^{-1/2}$</p> <p>$f(x) = 2x^{5/2} - 4x^{3/2} + 5x^{-1/2}$</p> <p>$f'(x) = 2 \cdot \frac{5}{2}x^{3/2} - 4 \cdot \frac{3}{2}x^{1/2} - 5 \cdot \frac{1}{2}x^{-3/2}$</p>
$f'(x) = \frac{21}{2}x^{5/2} - \frac{1}{x^{1/2}} - \frac{1}{2x^{3/2}}$	$f'(x) = 5x^{3/2} - 6x^{1/2} + \frac{5}{2x^{3/2}}$

Finding an Equation of a Tangent Line In Exercises 53–56, (a) find an equation of the tangent line to the graph of f at the given point.

- Equation of tangent line:**
- Find ordered pair $((x_1, y_1))$ using $f(x)$
 - Find slope m using $f'(x)$
 - $y - y_1 = m(x - x_1)$

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

$f(x) = 2x^{-3/4}$

$f'(x) = 2 \cdot \frac{-3}{4}x^{-7/4}$

$f'(1) = \frac{-3}{2(1)^{7/4}} = -\frac{3}{2}$

point: (1, 2)

slope: $m = -\frac{3}{2}$

$y - 2 = -\frac{3}{2}(x - 1)$

14) $y = (x - 2)(x^2 + 3x)$ (1, -4)

$y = x^3 + 3x^2 - 2x^2 - 6x$

$y = x^3 + x^2 - 6x$

$y' = 3x^2 + 2x - 6$

$y'(1) = 3(1)^2 + 2(1) - 6$

$y'(1) = -1$

point: (1, -4)

slope: $m = -1$

$y + 4 = -1(x - 1)$