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

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

Find the derivative of the functions below:

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

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

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

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

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.**

Equation of tangent line:

i) Find ordered pair $((x_1, y_1)$ using $f(x)$

ii) Find slope m using $f'(x)$

iii) $y - y_1 = m(x - x_1)$

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

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

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Key

Derivative Power Rule:

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

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

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

$f'(x) = \frac{5}{3} \cdot -6x^{-7}$

$f'(x) = -\frac{30}{3}x^{-7}$

$f'(x) = \frac{-10}{x^7}$

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

$g(x) = 3x^{9/2}$

$g'(x) = 3 \cdot \frac{9}{2}x^{7/2}$

$g'(x) = \frac{27}{2}x^{7/2}$

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

$f(x) = \frac{1}{3}x^{9/2}$

$f'(x) = \frac{1}{3} \cdot \frac{9}{2}x^{7/2} = \frac{9}{6}x^{7/2}$

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

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

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

$h(t) = \frac{7}{40t^3}$

$h(t) = \frac{7}{40}t^{-3}$

$h'(t) = \frac{7}{40} \cdot -3t^{-4}$

$h'(t) = \frac{-21}{40t^4}$

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

$f(t) = \frac{7}{27t^3}$

$f(t) = \frac{7}{27}t^{-3}$

$f'(t) = \frac{7}{27} \cdot -3t^{-4}$

$f'(t) = \frac{-21}{27}t^{-4}$

$f'(t) = \frac{-7}{9t^4}$

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

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

$f(x) = \frac{7}{x^{3/2}}$

$f(x) = 7x^{-3/2}$

$f'(x) = 7 \cdot \frac{-3}{2}x^{-5/2}$

$f'(x) = \frac{-21}{2x^{5/2}}$

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

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

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

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

Derivative Power Rule:

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

Power Rule Conditions:

i) All Radicals converted to Rational Exponents
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iii) All parentheses resolved, all terms expanded

Find the derivative of the functions below:

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

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

$f(x) = x(4-20x+25x^2)$

$f(x) = 4x-20x^2+25x^3$

$f'(x) = 4-40+75x^2$

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

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

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

$f'(x) = 10x+3x^{-2}-2x^{-3}$

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

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

$f(x) = (3x^4-2x+1)x^{-1/2}$

$f(x) = 3x^{7/2}-2x^{1/2}+1x^{-1/2}$

$f'(x) = 3\cdot\frac{7}{2}x^{5/2}-2\cdot\frac{1}{2}x^{-1/2}-\frac{1}{2}x^{-3/2}$

$f'(x) = \frac{21}{2}x^{5/2}-\frac{1}{x^{1/2}}-\frac{1}{2x^{3/2}}$

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

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

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

$f'(x) = 2\cdot\frac{5}{2}x^{3/2}-4\cdot\frac{3}{2}x^{1/2}-5\cdot\frac{-1}{2}x^{-3/2}$

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

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:

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

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

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

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

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

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

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: $m = -1$

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