1.5 The Chain Rule Worksheet

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1) Differentiate using the chain rule.

a) $f(x) = (-4x^2)^2$

b) $f(x) = (16x^2)^{\frac{3}{4}}$

c) $y = (4x+1)^2$

d) $y = (x^3 - x)^{-3}$

e) $y = \sqrt{2x - 3x^5}$

f) $y = \sqrt[5]{2 + 3x^2 - x^3}$

2) Determine $f'(1)$.

a) $f(x) = (4x^2 - x + 1)^2$

b) $f(x) = \dfrac{5}{\sqrt[3]{2x - x^2}}$

3) Determine an equation for the tangent to the curve $y = (x^3 - 4x^2)^3$ at $x = 3$

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4) Determine the point(s) on the curve $y = x^2(x^3 - x)^2$ where the tangent line is horizontal.

5) Differentiate each of the following.

a) $f(x) = (x + 4)^3(x - 3)^6$

b) $y = \left(\frac{x^2 - 3}{x^2 + 3}\right)^4$

Answer Key

1) a) $f'(x) = 64x^3$ b) $f'(x) = 12\sqrt{x}$ c) $y' = 8(4x + 1)$ d) $y' = \frac{-3(3x^2 - 1)}{x^4(x^2 - 1)^4}$ e) $\frac{dy}{dx} = \frac{2 - 15x^4}{2(2x - 3x^5)^{1/2}}$ f) $\frac{dy}{dx} = \frac{6x - 3x^2}{5(2 + 3x^2 - x^3)^{4/5}}$

2) a) 56 b) 0

3) $y = 729x - 2916$

4) $(-1, 0)$, $(1, 0)$, $(0, 0)$, $\left(-\frac{1}{\sqrt{2}}, \frac{1}{16}\right)$, and $\left(\frac{1}{\sqrt{2}}, \frac{1}{16}\right)$

5) a) $3(x + 4)^2(x - 3)^5(3x + 5)$ b) $\frac{48x(x^2 - 3)^3}{(x^2 + 3)^5}$

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