Name_____

Differentiation - Chain Rule

Date_____ Period____

Differentiate each function with respect to *x*.

1) $y = (x^3 + 3)^5$

2) $y = (-3x^5 + 1)^3$

3) $y = (-5x^3 - 3)^3$

4) $y = (5x^2 + 3)^4$

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

6) $f(x) = \sqrt{-2x^2 + 1}$

7) $f(x) = \sqrt[3]{-2x^4 + 5}$

8) $y = (-x^4 - 3)^{-2}$

Kuta Software - Infinite Calculus

Name_____

Differentiation - Chain Rule

Date_____ Period____

Differentiate each function with respect to *x*.

1) $y = (x^3 + 3)^5$

$$\frac{dy}{dx} = 5(x^3 + 3)^4 \cdot 3x^2$$
$$= 15x^2(x^3 + 3)^4$$

2) $y = (-3x^5 + 1)^3$

$$\frac{dy}{dx} = 3(-3x^5 + 1)^2 \cdot -15x^4$$
$$= -45x^4(-3x^5 + 1)^2$$

3) $y = (-5x^3 - 3)^3$

$$\frac{dy}{dx} = 3(-5x^3 - 3)^2 \cdot -15x^2$$
$$= -45x^2(-5x^3 - 3)^2$$

4) $y = (5x^2 + 3)^4$

$$\frac{dy}{dx} = 4(5x^2 + 3)^3 \cdot 10x$$
$$= 40x(5x^2 + 3)^3$$

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

$$f'(x) = \frac{1}{4}(-3x^4 - 2)^{-\frac{3}{4}} \cdot -12x^3$$
$$= -\frac{3x^3}{(-3x^4 - 2)^{\frac{3}{4}}}$$

6) $f(x) = \sqrt{-2x^2 + 1}$

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

7) $f(x) = \sqrt[3]{-2x^4 + 5}$

$$f'(x) = \frac{1}{3}(-2x^4 + 5)^{-\frac{2}{3}} \cdot -8x^3$$
$$= -\frac{8x^3}{3(-2x^4 + 5)^{\frac{2}{3}}}$$

8) $y = (-x^4 - 3)^{-2}$

$$\frac{dy}{dx} = -2(-x^4 - 3)^{-3} \cdot -4x^3$$
$$= \frac{8x^3}{(-x^4 - 3)^3}$$

Calculus Name _____

Exploring the Chain Rule- Day 2

Warm-Up:

1. Differentiate using the power rule. Simplify Completely.

a. $f(x) = 2x^3$

b. $g(x) = 2x^{-3}$

c. $h(x) = \frac{1}{2x^3}$

d. $F(x) = 5\sqrt{x}$

e. $G(x) = \frac{5}{\sqrt{x}}$

f. $H(x) = \frac{1}{5\sqrt{x}}$

2. Differentiate using power rule and chain rule. For this section, you do not need to simplify.

a. $f(x) = 2(3x^2 - 4x + 9)^3$

b. $g(x) = 2(3x^2 - 4x + 9)^{-3}$

c. $h(x) = \frac{1}{2(3x^2-4x+9)^3}$

d. $F(x) = 5\sqrt{(3x^2 - 4x + 9)}$

e. $G(x) = \frac{5}{\sqrt{(3x^2-4x+9)}}$

f. $H(x) = \frac{1}{5\sqrt{(3x^2-4x+9)}}$

Calculus Name _____

Exploring the Chain Rule- Day 2

Warm-Up:

1. Differentiate using the power rule. Simplify Completely.

a. $f(x) = 2x^3$

$f'(x) = 6x^2$

b. $g(x) = 2x^{-3}$

$g'(x) = \frac{-6}{x^4}$

c. $h(x) = \frac{1}{2x^3} = \frac{1}{2}x^{-3}$

$h'(x) = \frac{-3}{2x^4}$

d. $F(x) = 5\sqrt{x}$

$F'(x) = \frac{5}{2\sqrt{x}}$

e. $G(x) = \frac{5}{\sqrt{x}} = 5x^{-1/2}$

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

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

$H'(x) = \frac{-1}{10x^{3/2}}$

2. Differentiate using power rule and chain rule. For this section, you do not need to simplify.

a. $f(x) = 2(3x^2 - 4x + 9)^3$

$f'(x) = 6(3x^2-4x+9)^2(6x-4)$

b. $g(x) = 2(3x^2 - 4x + 9)^{-3}$

$g'(x) = -6(3x^2-4x+9)^{-4}(6x-4)$

c. $h(x) = \frac{1}{2(3x^2-4x+9)^3} = \frac{1}{2}(3x^2-4x+9)^{-3}$

$h'(x) = \frac{-3}{2}(3x^2-4x+9)^{-4}(6x-4)$

d. $F(x) = 5\sqrt{(3x^2 - 4x + 9)}$

$F'(x) = \frac{5}{2}(3x^2-4x+9)^{-1/2}(6x-4)$

e. $G(x) = \frac{5}{\sqrt{(3x^2-4x+9)}} = 5(3x^2-4x+9)^{-1/2}$

$G'(x) = \frac{-5}{2}(3x^2-4x+9)^{-3/2}(6x-4)$

f. $H(x) = \frac{1}{5\sqrt{(3x^2-4x+9)}} = \frac{1}{5}(3x^2-4x+9)^{-1/2}$

$H'(x) = \frac{-1}{10}(3x^2-4x+9)^{-3/2}(6x-4)$