

**W5 – The Chain Rule**

MCV4U

Jensen

**Unit 1**

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

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

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

**Answers:**

1a)  $f'(x) = 64x^3$  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)  $\frac{dy}{dx} = \frac{2-15x^4}{2(2x-3x^5)^{\frac{1}{2}}}$  f)  $\frac{dy}{dx} = \frac{6x-3x^2}{5(2+3x^2-x^3)^{\frac{4}{5}}}$

2)a) 56 b) 0

3)  $y = 729x - 2916$

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

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