GRADE 12 CALCULUS ASSIGNMENT
CHAIN RULE AND A BIT MORE

[45 Marks]

1. Differentiate the following functions of x. Use Leibniz notation for c and d.

[3&4] a) $f(x)=\left(x^2-3x+6\right)^{-3}$ b) $f(x)=x^2\left(\cos^4 x\right)$

[4&6] c) $f(x)=\sqrt{7x^3-2x}$ d) $f(x)=\left[sin\left(\sqrt{7x^3-2x}\right)\right]^4$

2. Find the equation of the normal to the tangent of the following function at x = 2.

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

[8]

Demonstrate this problem and its solution with a sketch.

3. Find all values of x where the following function has zero derivative.

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

4. The following represents a derivative function. Determine $f(x)$.

[3] $$f'(x)=-5x^2\left[cos\left(cos(x^3+1)\right)\right]sin(x^3+1)$$

5 Suppose an ant is crawling along the function $y=(1+0.1x^2)^5$, and at x = -2 the ant's height(y value) is decreasing at the rate of 3cm/s. At this instant what is

[5] the ant's rate of change in it's x position?

6. Use implicit differentiation to find a formula for slope of the curve in terms of x and

[4] y and evaluate it at the given point.

$$x^2y+sin(xy)=\pi \qquad \text{at } x=1,\ y=\pi$$

7. Derive the Quotient Rule from the Product Rule. Consider that if Q is the quotient of y and z: $Q=\frac{y}{z}$ then y is the product of Q and z, and if you use the Product Rule on

[3] that, and solve for $\frac{dQ}{dx}$, you should get the Quotient Rule.