

Name _____ Date _____

MCB4U Assignment "The Chain Rule and Its Applications" (Unit 4)

/20 K&U

/12 APP

/5 COM

Part 1: Do each of the following, answering in the space provided. [4 Marks K&U]

/4 TIPS

1. If g is a function of w , then $\frac{d}{dw}(g^r) =$ (_____)
A. rg^{r-1} B. $rg^{r-1}\frac{dg}{dx}$ C. $rg^{r-1}\frac{dg}{dw}$ D. $g^r\frac{dg}{dw}$ E. none of these
2. If f measures distance and t is time, then $\frac{d^2f}{dt^2}$ represents the _____ function. (_____)
A. displacement B. velocity C. acceleration
D. rate of change of displacement E. none of these
3. If $h(x) = 5x^2 - x + 7$ and $g(x) = 2\sqrt{6(x-1)}$, then $g(h(2)) =$ (_____)
A. $127 - 2\sqrt{6}$ B. $63\sqrt{2}$ C. 25 D. 24 E. none of these
4. What is the value of $\frac{ds}{dy}$, if $\frac{ds}{dr} = 4\frac{1}{3}$ and $\frac{dy}{dr} = \frac{4}{3}$ (_____)
A. $3\frac{1}{4}$ B. 3 C. $\frac{42}{9}$ D. $\frac{7}{2}$ E. none of these

Part 2: Do each of the following, answering in the space provided and showing all work. 5 of the communications marks are overall throughout the test.

1. Differentiate.
 - a) $y = (3x^2 - x^5)^4$ [2 Marks K&U]
 - b) $y = \sqrt[3]{2x^2 + 3x^4}$ [2 Marks K&U]
 - c) $g(x) = (3x^2 + 2)^4 (5x^4 - 3x)^3$ (leave in a fully factored form) [4 Marks K&U]
 - d) $y = \frac{(7 + 4x)^2}{(8x - 5x^3)^4}$ [3 Marks K&U]

2. Find $\frac{dy}{dx}$ for each of the following.

a) $x^2 + 4y^2 - 24 = 0$ [2 Marks K&U]

b) $x^2 - 3xy + 2y^2 = 8$ [3 Marks K&U]

3. Find an equation of the tangent to $2x^4 - 5xy^2 + 3y^4 = 30$ at the point (1,2). [4 Marks App]

4. A water tank has the shape of an upside down cone ($V = \frac{\pi r^2 h}{3}$), with a base radius of 8 m and a height of 12 m. If the tank is being filled with water at a rate of $5 \text{ m}^3/\text{s}$, at what rate is the water level increasing when the water is 5 m deep? [4 Marks App]

5. Two cars leave a right-angle intersection at the same time. One travels north at a rate of 50 km/h, and the other travels east at 60 km/h. After 2 hours, how fast is the distance between the two cars increasing? [4 Marks App]

6. Use implicit differentiation to show that, whenever a circle with equation $x^2 + y^2 = a^2$ intersects a hyperbola $x^2 - y^2 = b^2$, where $a^2 > b^2$, the slopes of the tangents at the points of intersection are equal in magnitude, but opposite in sign. [4 Marks TIPS]