Okanagan College

Math 112 (071) Fall 2009

Term Test Three – Marksheet

Instructor: Clint Lee

Wednesday, November 26

Student Name: ____________________ Total Marks: ________ 40

Problem	Marks	
1 (a)	/2	
1 (b)	/2	
1 Total		/4
2 Total		/2
3 Total		/2
4 (a)	/3	
4 (b)	/4	
4 (c)	/3	
4 Total		/10
5 (a)	/4	
5 (b)	/3	
5 Total		/7
6 Total		/4
7 (a)	/2	
7 (b)	/4	
7 Total		/6
8 (a)	/2	
8 (b)	/3	
8 Total		/5
Exam Total		/40

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Instructions. Do all parts of all 8 questions. Show all work and give explanations where required. You may receive part marks for a question if your work is correct even if the final answer is incorrect. However, if your answer is incorrect and no work or explanation is given, you will receive no marks. The number of points for each question is given in the left margin, total 40.

In problems 1 through 3 give a brief answer. You will be marked only on your answer, not on your work.

1. Differentiate each function. Do not simplify

[2] (a) $f(x) = \sin\left(x^2\right)$

[2] (b) $s = \ln \sqrt[3]{x^3 + 1}$

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[2] 2. Suppose that x and y satisfy the equation $xe^y = y^2 + 1$ and that y is decreasing at the rate of 2 units per minute. Find the time rate of change of x when $x = 1$ and $y = 0$. Give your answer in exact form (no decimals).

[2] 3. Verify that the linear approximation to $f(x) = \ln(x-2)$ near $x = 3$ is

$$\ln(x-2) \approx x - 3$$

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4. Differentiate each function. Simplify only if required.

[3] (a) $f(x) = x^2 \sin^3 2x$

[4] (b) $y = \arctan\left(\sqrt{x^2 - 1}\right)$. Simplify.

[3] (c) $g(t) = \dfrac{\sec t}{\tan t + 1}$

[4] 5. (a) Consider the equation

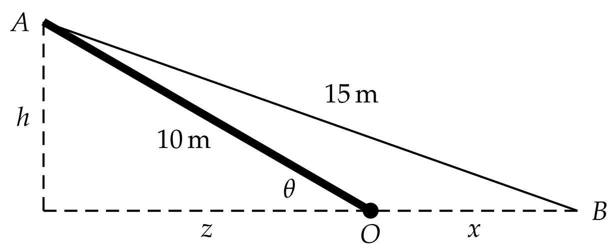
$$2x \sin y - y \cos x = x + y$$

Find $\dfrac{dy}{dx}$ for any function defined by this equation.

[3] (b) Verify that the point $\left(\frac{1}{2}\pi, \frac{1}{2}\pi\right)$ lies on the graph of the equation above. Find the equation of the line tangent to the graph of the equation above at the point $\left(\frac{1}{2}\pi, \frac{1}{2}\pi\right)$.

[4] 6. Use logarithmic differentiation to find $\dfrac{dy}{dx}$ for $y = \left(x^2 + 1\right)^{\sin x}$.

7. A 10-metre totem pole will be raised by anchoring one end, labeled O in the diagram, and attaching a 15-metre rope to the other end, A. The rope is laid out along the totem pole and extended beyond the anchored end to point B. The end at B is then pulled along the ground at 20 cm/s directly away from the anchored end of the totem pole raising the end A off the ground.



[2] (a) Use Pythagoras theorem for each of the two right triangles in the diagram to show that

$$x^2 + 2xz = 125$$

[4] (b) When the sun is directly overhead, the distance z in the diagram above is the length of the shadow cast by the totem pole. Find the rate at which the length of the shadow cast by the totem pole is lengthening 50 seconds after the rope starts moving.

8. In forestry the volume of wood in a tree is estimated by measuring the circumference of the tree at the base and computing the radius of the base of the tree knowing the circumference. Then the volume of the tree is computed by assuming that the tree is a cone whose height is approximately 100 times the radius of the base.

[2] (a) Given that the volume of a cone of radius r and height h is $V = \frac{1}{3}\pi r^2 h$, find a formula for the volume estimate for a tree whose circumference at the base is C. Express the volume as function of C.

[3] (b) The base circumference of a tree is measured to be 80 cm with a maximum error of 1 cm. Use differentials to estimate the maximum possible error in the calculated volume of the tree. Give both the absolute and relative errors.