Name: _____ GRADE: /39

Student #: _____

Okanagan University College
Salmon Arm Campus

MATH 112 – Calculus I

MIDTERM EXAM #2

19 November 2004

Instructor: Richard Taylor

Time allowed: *N/A take home exam*

Instructions:

1. *Read all instructions carefully.*
2. *Read the whole exam before beginning*; make sure you have all 8 pages.
3. Organize and write your solutions neatly. If you run out of room, continue your solution on the back of the page.
4. Where appropriate, show your work and explain your solution method—a correct final answer alone is not sufficient to guarantee full credit. Part marks may be awarded even if you don't obtain the final answer.

Problem 1: Differentiate each of the following:

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(a) $f(x) = \ln(x^2 e^x)$

(b) $h(x) = e^{\cos x} + \cos(e^x)$

(c) $F(x) = \dfrac{\sin(mx)}{x}$

(d) $g(x) = \tan^{-1}(\sin^{-1}\sqrt{x})$

Problem 2: Find $f'(x)$ if $f(x) = (\cos x)^x$. (Hint: start by taking a logarithm of both sides.)

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Problem 3: Find equations for the tangent lines to the curve

$$y(y^2 - 1)(y - 2) = x(x - 1)(x - 2)$$

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at the points $(0, 1)$ and $(0, 2)$.

Problem 4: Find all of the points on the ellipse $x^2 + 2y^2 = 1$ where the tangent line has slope 1.

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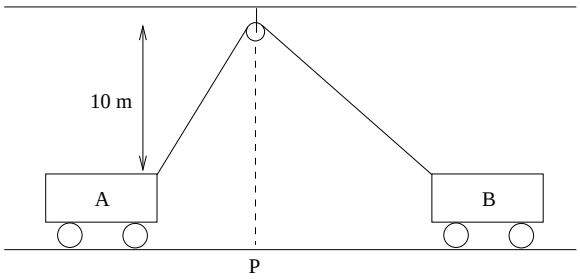
Problem 5: Two carts are attached by a rope 40 m long that passes over a pulley suspended from the ceiling, as shown in the diagram below. When cart B is 25 m from point P, it is rolling to the right at 3 m/s. How fast is cart A moving? (Assume the pulley has negligible size, and that both carts remain on the ground.)



Problem 6: Find, accurate to three decimal places, the point on the curve $y = \sin x$ that is closest to the point $(1, 1)$. (Hint: use Newton's Method to solve for critical points.)

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Problem 7: (a) Use a linear approximation to estimate the value of $\ln(0.9)$.

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(b) Using an appropriate Taylor polynomial, estimate the value of $\ln(0.9)$ accurate to 5 decimal places.

Problem 8: The figure below shows a top-down view of a hallway with a 90° corner. What is the longest ladder that can be carried (horizontally) through the corner?

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