

Math 2A: Single Variable Calculus

Midterm 2 (v1)

Fall 2014 (44170)

Name:

Student Id#:

Discussion Class Time:

Total marks = 50 (per question in brackets)

No calculators or other electronic devices

Unless otherwise stated, include all your working for full credit

No leaving the exam in the last 10 minutes (be courteous to those finishing off!)

Question	Marks
1	/16
2	/6
3	/10
4	/8
5	/10
Total	/50

1. Find the derivatives of the following functions:

(a) $f(x) = \sin x + 2x^2$ (2)

(b) $g(x) = 2e^{3x} - x^3$ (2)

(c) $s(t) = \frac{t^4 - 2}{2t - 7}$ (4)

(d) $h(x) = \ln(17 \cos^2 x)$

(4)

(e) $y(x) = \tan^{-1}(13 - 2e^x)$

(4)

2. Use logarithmic differentiation to compute

(6)

$$\frac{d}{dx} \frac{x^7 \sqrt{2x^2 + 4}}{(2x + 3)^{1/5} e^{3x}}$$

3. Ship X is moving East at 10 miles per hour, *towards* a lighthouse L . Ship Y is moving North at 8 miles per hour, *away* from the same lighthouse.

(a) Find an expression for the distance of the ships from each other in terms of their distances from the lighthouse. *Draw a picture!* (4)

(b) Suppose that the rate of change of the distance between the ships is *zero*. If ship X is 4 miles West of the lighthouse, how far away from the lighthouse is ship Y ? (6)

4. (a) Find the linear approximation to the function $f(x) = \log_8 x$ at $x = 8$. (4)
Recall that $\log_8 x = \frac{\ln x}{\ln 8}$

- (b) Use your answer to (a) to find an approximation to $\log_8 8.2$. (4)

5. A curve has equation $y^3 + e^x y + x = 2$.

(a) Find the slope of the curve at the point $(0, 1)$.

(4)

(b) If the point $(0.1, y)$ lies on the curve, find (approximately) the value of y .

(4)

(c) Why doesn't $\frac{dy}{dx}(3, 4)$ makes sense?

(2)