

Final Exam – Review 1 – Problems

Peyam Ryan Tabrizian

Monday, December 9th, 2013

1 Graphing

Problem 1

Graph $y = x \ln(x) - x$

2 Limits

Problem 2

Evaluate the following limits:

(a)

$$\lim_{x \rightarrow \infty} \frac{e^{\sin(x)}}{x}$$

(b)

$$\lim_{x \rightarrow -\infty} \frac{x}{\sqrt{x^2 + 1}}$$

(c)

$$\lim_{x \rightarrow 0} \frac{\int_0^x \sin(t^2) dt}{x^3}$$

(d)

$$\lim_{x \rightarrow 0^+} (\sin(x))^{\sin(x)}$$

3 Optimization

Problem 3

Find the point(s) on the parabola $y = x^2 - 4$ that is (are) closest to the point $(0, \frac{1}{2})$

4 Related Rates

Problem 4

A ship is sailing at 9 mph directly towards a point P on the shore, on a course that is perpendicular to the shoreline. A searchlight on the ship's prow revolves at 6 revolutions per hour. When the ship is 3 miles from P , the searchlight beam hits the shoreline at a point Q that is 4 miles along the shore from P , moving along the shore away from P . How fast is Q moving away from P at this time?

5 Derivatives

Problem 5

Use the definition of the derivative to find $f'(x)$, where $f(x) = e^x$

Problem 6

Find the equation of the tangent line of $y^3 = x^4 + 8y - 9$ at $(1, 2)$