King Fahd University of Petroleum & Minerals
Department of Mathematics and Statistics
Math 132 – Second Major Exam

First Semester 2007–2008 (071) December 4, 2007 7:00 pm – 8:15 pm

Name : _____ ID # _____

1. Given the function $f(x) = x^3 - 3x^2 - 24x$, find the interval on which the function is increasing and the relative extrema of the function. (2 points)

2. Discuss the concavity and find the inflection points of the function $f(x) = e^x(x+4)$. (2 points)

3. Evaluate $\int \frac{e^x}{1+e^x} dx$ (2 points)

4. Given the total cost function $C = \frac{q^2}{50} + 5q + 2$, find the average cost and then find the level of production, *q*, at which the average cost is minimum. (2 points)

5. Use differentials to approximate $\sqrt{4.1}$ (2 points)

6. Find the area bounded by $y = x^2 - 2$ and $y = x$. (2 points)

7. Find the absolute extrema of $f(x) = 3x^4 - x^6$ on [-1,2]. (2 points)

8. Evaluate $\int_1^e \ln x \, dx$ (2 points)

9. If $f'(x) = \frac{1}{x} + 3$, $f(1) = 0$, find $f(e^2)$. (2 points)

10. A rectangular fence is to be made from a 100 meter wire. Find the dimensions of the rectangle of maximum area. (2.5 points)

11. Sketch a graph of $f(x)$ that has the following properties (3.5 points)

Vertical Asymptotes : $x = 4, x = -2$

$f(x) \geq 0$ *on* $(-\infty, -2) \cup [0,3] \cup (4, \infty)$, $f(x) < 0$ *elsewher*

$x - \text{int.} = 0, 3$

$y - \text{int.} = 0$

R.Max. at $(2, 2)$

R.Min. at $(-4, 0)$

Inflection Po int *s at* $(0,0)$ *and* $(1,1)$

Concave up on $(-\infty, -2) \cup (0,1) \cup (4, \infty)$, *Concave down elsewhere*

$\lim_{x \to +\infty} f(x) = 3, \lim_{x \to -\infty} f(x) = +\infty$