

King Fahd University of Petroleum and Minerals
Department of Mathematical Sciences
Semester II, 2005-2006 (052)
MATH 101 – Exam 3

NAME: _____	ID: _____	Section: _____
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Part 2: Essay Questions (1 hour)

Score (out of 10)	
Question 1	
Question 2	
Question 3	
Question 4	
Question 5	
Total (out of 50)	

1. Two cars start moving from the same point. One travels east at 40 km/h and the other travels west at 30 km/h. How fast is the distance between the cars increasing when they are 50 km away from each other?

2. Let $f(x) = x \tan x$ defined on the interval $(-\frac{\pi}{2}, \frac{\pi}{2})$

- (a) Find the critical numbers of f .
- (b) Find the intervals on which f increases and decreases.
- (c) Find the absolute maximum and minimum.

3. Show that the equation

$$4x^5 + x^3 + 2x + 1 = 0$$

has exactly one real root.

4. Use differentials (or linear approximation) to estimate $\cot(134^\circ)$.

5. Let $f(x) = xe^{-x}$.

Showing all details on the next empty page, find each of the following:

1.
 - (a) Domain($f(x)$) =
 - (b) x -intercept(s) (if any):
 - (c) y -intercept (if any):
 - (d) Symmetries (if any):
 - (e) $\lim_{x \rightarrow +\infty} f(x) =$
 - (f) $\lim_{x \rightarrow -\infty} f(x) =$
 - (g) Asymptote(s) (if any):
 - (h) Critical Point(s) (if any):
 - (i) Interval(s) on which $f(x)$ is increasing (if any):
 - (j) Interval(s) on which $f(x)$ is decreasing (if any):
 - (k) Relative Maxima (if any):
 - (l) Relative Minima (if any):
 - (m) Absolute Maximum (if any):
 - (n) Absolute Minimum (if any):
 - (o) Interval(s) on which the curve of $y = f(x)$ is concave up (if any):
 - (p) Interval(s) on which the curve of $y = f(x)$ is concave down (if any):
 - (q) Inflection Point(s) (if any)
2. **Draw the graph of $f(x)$ using the input found above:**