Name ____ MTH 1001 - Calculus 1

PRACTICE ADVANCED STANDING EXAM

1. (a) Write the general *definition of the derivative* for a function $f \;\; x$

[14pts]

(b) Find $f \;\; x$ by using the *definition of the derivative* with the following function:

$f(x) \quad \frac{1}{x}$

2. Find the derivative: $f \;\; x \quad x^3 \tan \; 2x \quad 1$

[12pts]

3. Find the derivative: $f \;\; x \quad e^{x^3} \quad \ln \; \sec x \quad \csc \; \ln x$

[9pts]

7. A toy car moves along a straight track during time $0 \le t \le 4$. It's position at any
[10pts] time from a fixed point along the track is given by $s(t) = t^3 - 3t^2$
Answer the following about the motion of the car.
(Note: The time *t* is measured in minutes and distance *s* in inches.)

(a) What is the position, velocity, and acceleration of the car at the time *t* = 3 minutes?

(b) At what time does the car come to a stop?

8. A 5 ft ladder is leaning against a wall and starts to slide. How fast is the bottom
[12pts] edge of the ladder moving along the floor when the top corner of the ladder is 3 ft up the wall and sliding down the wall at a rate of 8 ft/sec?

9. Use L'Hôpital's Rule to evaluate the following limit:
[8pts]

$$\lim_{x \to 0} \frac{x^3 - 5\sin x}{x\cos x}$$

10. Graph the following Rational Function:

$$f \quad x \qquad \frac{36 \quad x \quad 1}{x^2}$$

11. A box with a closed top is going to be manufactured so that its base is a square and its volume
[12 pts] will be 100 . If the material to make the top and bottom of the box cost $50 per square cm and the material for the sides costs $4 per square cm, find the dimensions that will minimize the cost of the box.

12. Find the exact area under the curve $f(x) \quad 2x \quad 1$ over the interval a, b, where x_i is the right endpoint of each equal subinterval, given $a \quad 1$ and $b \quad 3$.
[16pts]

Hint – Evaluate the limit: $\underset{n}{\quad} \sum_{i}^{n} \quad {}_{i}$

$\sum_{i\ 1}^{n} 1 \quad n \qquad \sum_{i\ 1}^{n} i \quad \frac{n\ n\ 1}{2} \qquad {}_{1}^{2} \quad \frac{1\ 2\ \ 1}{6} \qquad \sum_{i\ 1}^{n} i^3 \quad \frac{n\ n\ 1}{2}^{2}$