Exam 2 April 5, 2005 SHOW ALL WORK
Math 25 Calculus I Either circle your answers or place on answer line.

[10] 1a.) Find the linearization of $f(x) = x^2 + 3x$ at $x = 0$.

Answer 1a.) _____

[6] 1b.) Use this linearization to approximate $f(0.1)$.

Answer 1b.) _____

[2] 1c.) $f''(0) =$ _____

[2] 1d.) Is the answer to 1b an over-estimate or an under-estimate? _____

[2] 1e.) In the example in 1b, $\Delta x =$ _____, $\Delta y =$ _____, $dx =$ _____, $dy =$ _____.

2.) Find y'.

[15] 2a.) $xy = 4(x+y)^{\frac{3}{2}}$, then $y' =$ _____

[15] 2b.) $y = x^{cos(x)}$, then $y' =$ _____

[4] 3a.) State the extreme value theorem.

[8] 3b.) Use calculus to find the absolute maximum and absolute minimum values of $f(x) = x^3 - 3x^2 + 1$ on $[-2, 3]$.

The absolute maximum is _____ and occurs at $x =$ _____

The absolute minimum is _____ and occurs at $x =$ _____

[5] 4.) Sketch the graph of a function whose first derivative is always positive and whose second derivative is always negative.

[15] 5.) Choose one of the following (clearly indicate your choice).

5a.) A boat is pulled into a dock by a rope attached to the bow of the boat and passing through a pulley on the dock that is 2m higher than the bow of the boat. If the rope is pulled in at a rate of 5m/sec, how fast is the boat approaching the dock when it is 10m from the dock.

5b.) A particle is moving along the curve $y = x^2 - 1$. As the particle passes through the point (2, 3), it's x-coordinate increases at a rate of 6m/sec. How fast is the distance from the particle to the origin changing at this instant?

Answer 5.) _____

6.) Find the following for $f(x) = \frac{x}{(x-1)^2}$ (if they exist; if they don't exist, state so). Use this information to graph f.

Note $f'(x) = \frac{-(x+1)}{(x-1)^3}$ and $f''(x) = \frac{2(x+2)}{(x-1)^4}$

[1] 6a.) critical numbers: _____

[1.5] 6b.) local maximum(s) occur at $x =$ _____

[1.5] 6c.) local minimum(s) occur at $x =$ _____

[1.5] 6d.) The global maximum of f on the interval [0, 5] is _____ and occurs at $x =$ _____

[1.5] 6e.) The global minimum of f on the interval [0, 5] is _____ and occurs at $x =$ _____

[1.5] 6f.) Inflection point(s) occur at $x =$ _____

[1] 6g.) f increasing on the intervals _____

[1] 6h.) f decreasing on the intervals _____

[1.5] 6i.) f is concave up on the intervals _____

[1.5] 6j.) f is concave down on the intervals_____

[1.5] 6k.) Equation(s) of vertical asymptote(s)_____

[2] 6l.) Equation(s) of horizontal asymptote(s)_____

[4] 6m.) Graph f