MATH 160 Test #3 Name_____
Spring 2004

Directions: Communicate your responses in the spaces provided. ***Clearly state your conclusions using complete sentences.***

1. (5 points) In the space provided, write out the definition for "the derivative of f(x)." Use the definition stated in the shaded box at the top of page 157 in your text.

✓ If $y = f(x)$, the derivative of $f(x)$, denoted by $f'(x)$ is defined to be $\lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$ ✓✓ if the limit exists. ✓

2. (5 points) In the space provided, show how to use the definition of the derivative to find the derivative of f(x) where $f(x) = 3x^2 - 10$.

$$f'(x) = \lim_{h \to 0} \frac{[3(x+h)^2 - 10] - [3x^2 - 10]}{h} \quad \checkmark$$

$$= \lim_{h \to 0} \frac{3x^2 + 6xh + 3h^2 - 10 - 3x^2 + 10}{h}$$

$$= \lim_{h \to 0} 6x + 3h \quad \checkmark$$

$$= 6x \quad \checkmark\checkmark$$

3. (5 points) Suppose a ball is launched vertically upward so that its distance in feet above the ground t seconds after being launched is given by $s(t) = -16t^2 + 128t + 6$. Show how to use calculus to determine when the ball's velocity will be zero ft/sec. Show how to find the ball's maximum height above the ground.

$s'(t) = -32t + 128$ ✓

$s'(t) = 0$ if $-32t + 128 = 0$ ✓

$-32t = -128$

$t = 4$ ✓

So, the ball's velocity is zero ft/sec after 4 seconds. ✓

The ball's maximum height is $s(4) = -256 + 512 + 6 = 262$ feet. ✓