

Math 108
Quiz 4

Name (print) **KEY**
Spring 2006

Work carefully and neatly. You must show all relevant work! You may receive no credit if there is insufficient work. NO GRAPHING CALCULATORS!

- [6pt] 1. Using the limit definition to find the derivative of $f(x) = x^2 - 3x$. Then find the equation of the tangent line to the curve when $x = 2$.

$$\begin{aligned}\frac{f(x+h) - f(x)}{h} &= \frac{(x+h)^2 - 3(x+h) - [x^2 - 3x]}{h} = \\ \frac{x^2 + 2hx + h^2 - 3h - x^2 + 3x}{h} &= \frac{2hx + h^2 - 3h}{h} = 2x - 3 + h.\end{aligned}$$

Take the limit as $h \rightarrow 0$ and we get

$$*f'(x) = 2x - 3*$$

Then $f'(2) = 4 - 3 = 1$ which is the slope of the tangent line.

The equation of the tangent line is

$$y + 2 = 1(x - 2) \text{ or } *y = x - 4*$$

- [4pt] 2. An object moves in a straight line so that its distance from the point where it started is given by the function $g(t) = t^2 - 6t$ for $0 \leq t \leq 10$. Determine at what times the object is moving backwards. (You may use any legitimate method for computing the derivative.)

Then $g'(t) = 2t - 6$ (You can use the rules I gave you.)

Thus the object is moving backward when its velocity is negative, that is $v(t) = g'(t) < 0$ or $2t - 6 < 0$. Hence it is moving forward when

$$*0 \leq t < 3*$$