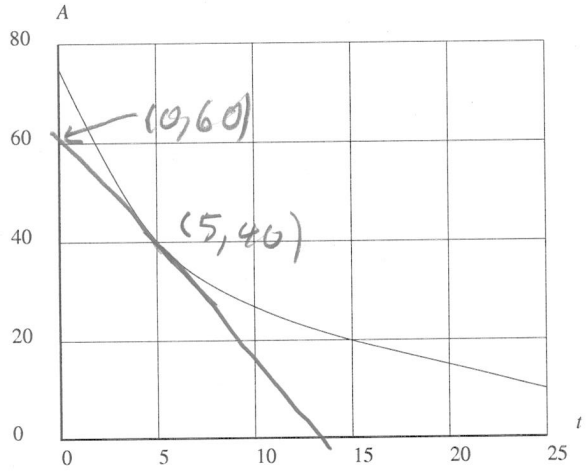
Mathematics 122

Quiz # 5 Name: key

You must show your work to get full credit.

1. The following figure shows the number of arces, A, of wetlands in a small county as a function of years, t, since 1980.



(a) What is the average rate of change of A between $t = 5$ and $t = 15$?

$\frac{\Delta A}{\Delta t} = \frac{A(15)-A(5)}{15-5} = \frac{20-40}{10} = -2$ Average rate of change is -2 Acres/yr

(b) Draw the tangent line to the graph where $t = 5$, choose two points on that line and use them to compute the slope of the tangent line.

slope $= \frac{40-60}{5-0} = \frac{-20}{5} = -4$ Slope is -4

(c) Estimate $A'(5)$. = slope of tangent line $A'(5) \approx -4$

2. Let $f(x) = x^2$.

(a) Compute the average rate of change between $t = 3$ and $t = 3.1$

$\frac{\Delta f}{\Delta t} = \frac{(3.1)^2 - 3^2}{3.1-3} = 6.1$ Rate is 6.1

(b) Compute the average rate of change between $t = 3$ and $t = 3.01$

$\frac{\Delta f}{\Delta t} = \frac{(3.01)^2 - 3^2}{3.01-3} = 6.01$ Rate is 6.01

(c) Compute the average rate of change between $t = 3$ and $t = 3 + h$, simplify your answer and set $h = 0$ to get the exact value of $f'(3)$.

$\frac{\Delta f}{\Delta t} = \frac{(3+h)^2 - 3^2}{3+h-3} = \frac{9+6h+h^2-9}{h}$ $f'(3) = 6$

$= \frac{h(6+h)}{h} = 6+h$

when $h = 0$ this becomes $6+0 = 6$