Math 171A
Fall 2009
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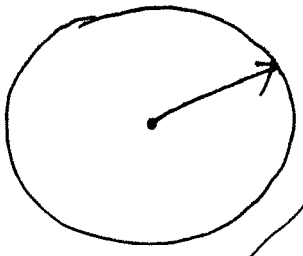
Differential Calculus
Quiz 5
Write your name on this quiz

1. Suppose that a circular disk is expanding in such a way that its area is growing at 2 in^2/s. What is the rate at which its radius is growing, at the moment when the disk has area 9π?



$\frac{dA}{dt} = 2 \qquad \frac{dr}{dt} = ?$ (when $A = 9\pi$)

when $A = 9\pi$, $r = 3$ b/c $A = \pi r^2$,

$A = \pi r^2$ — so put $r = 3$ here

$\frac{dA}{dt} = 2\pi r \frac{dr}{dt} \rightarrow 2 = 2\pi r \frac{dr}{dt} \rightarrow \frac{dr}{dt} = \frac{1}{\pi r} \rightsquigarrow \boxed{\frac{dr}{dt} = \frac{1}{3\pi} \text{ in/s}}$

2. Use a linear approximation to estimate sin(.01).

$f(x) = \sin(x)$. 0.01 is close to 0, so use the linear approximation for $\sin(x)$ at $x = 0$:

$$L(x) = f(0) + f'(0)(x-0) = \sin(0) + \cos(0)(x-0)$$

$$\| \qquad \times$$

So $L(x) = x$.

So $L(0.01) = 0.01 \leftarrow$ $\boxed{\text{So } \sin(0.01) \approx 0.01.}$