Name_____ October 18, 2016

**Quiz 5**

1. Use a linear approximation to estimate $\ln 1.01$

2. The radius of a circle is increasing at a rate of 2 cm/s. At what rates are the area and the circumference of the circle increasing when the radius of the circle is 6 cm?

① $f(x) = \ln x$

$f(1) = 0$

$f(1.01) = ?$

$f(x) \approx \underbrace{f(1)}_{=0} + f'(1)(x-1)$

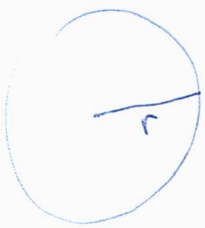
$f'(x) = \frac{1}{x} \Rightarrow f'(1) = 1$

We get $f(x) \approx 0 + 1(x-1) = x - 1$ when $x \approx 1$. Take $x = 1.01$.

$f(1.01) \approx 1.01 - 1 = 0.01$

② $r = r(t)$

$r'(t) = 2$




Circumference $p = 2\pi r$

$p'(t) = 2\pi r'(t) = 4\pi$

Area $S = \pi r^2$

$S'(t) = 2\pi r(t) \underbrace{r'(t)}_{=2} = 4\pi r(t)$

When $r(t_0) = 6$,

$S'(t_0) = 4\pi \times 6 = 24\pi$.