Math 121 S10N03 - Quiz 5
Mar 9 2010

Name:
Stu#: SOLUTIONS.

(1) [6 points] Determine the linearization (or linear approximation) $L(x)$ of $f(x) = \sin x$ at $a = \pi/6$.

$f(x) = \sin(x)$; $f(a) = \sin(\frac{\pi}{6}) = \frac{1}{2}$

$f'(x) = \cos(x)$; $f'(a) = \cos(\frac{\pi}{6}) = \frac{\sqrt{3}}{2}$.

$\therefore L(x) = f(a) + f'(a)(x-a)$

$$L(x) = \frac{1}{2} + \frac{\sqrt{3}}{2}\left(x - \frac{\pi}{6}\right).$$

(2) [9 points] Use a linear approximation to estimate $\sqrt{9.1}$.

Here $f(x) = x^{1/2}$, $a = 9$.

$f(a) = 9^{1/2} = 3$

$f'(x) = \frac{1}{2}x^{-\frac{1}{2}}$; $f'(a) = \frac{1}{2}(9)^{-\frac{1}{2}} = \frac{1}{6}$

$\therefore L(x) = f(a) + f'(a)(x-a)$

$= 3 + \frac{1}{6}(x-9)$

$\therefore \sqrt{9.1} \approx L(9.1) = 3 + \frac{1}{6}(9.1 - 9)$

$= 3 + \frac{1}{6}(0.1)$

$= 3 + \frac{1}{60}$

$= \frac{181}{60}$