MATH 205 – Calculus I **SQ 4.6**

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Instructions: Though calculators can be used for all the questions, all problems require you to show your work. Any answer without proper justification will receive ***ZERO*** credit. Only **EXACT** answers will receive full credit unless otherwise noted.

1. a) Determine $L(x)$ for $f(x) = 8(3x-1)^{\frac{2}{3}}$ for $x = 3$

$f'(x) = \frac{16}{3}(3x-1)^{-1/3}(3)$

$f(x) = \frac{16}{\sqrt[3]{3x-1}}$

$f(3) = 32$

$f'(3) = 8$

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

$L(x) = 32 + 8(x-3)$

$L(x) = 32 + 8x - 24$

$L(x) = 8x + 8$

b) use $L(x)$ to approximate $f(x)$ at $x = 3.1$

$L(3.1) = 8(3.1) + 8$

$L(3.1) \approx 32.8$

2. Use differentials to approximate the change in the volume of a sphere when its radius changes from $r = 2$ in to $r = 2.07$ in.

$r = 2$

$dr = 2.07 - 2 = .07$

$V_{sphere} = \frac{4}{3}\pi r^3$

$V'(r) = 4\pi r^2$

$dy = f'(x)dx$

$dy = 4\pi(2)^2(.07)$

$dy = 16\pi(.07)$

$dy \approx 3.52$

$dy = \frac{28}{25}\pi$