Your Name: Key

Calculus I, Math 151-06, Quiz #6

1. **[12 points]** Use an appropriate linear approximation to estimate $(3.97)^3$. Simplify your answer.

$f(x) = x^3$ $\quad a = 4$ $\quad f(a) = 4^3 = 64$

$f'(x) = 3x^2$ $\quad f'(a) = 3(4)^2 = 48$

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

$L(x) = 64 + 48(x - 4)$

$(3.97)^3 = f(3.97) \approx L(3.97) = 64 + 48(3.97 - 4)$

$= 64 + 48(-0.03)$

$= 64 - 1.44 = \boxed{62.56}$

2. **[5 points]** Evaluate and simplify $\cosh(\ln 3)$.

$$\cosh x = \frac{e^x + e^{-x}}{2}$$

$$\cosh(\ln 3) = \frac{e^{\ln 3} + e^{-\ln 3}}{2} = \frac{3 + e^{\ln 3^{-1}}}{2} = \frac{3 + e^{\ln(\frac{1}{3})}}{2}$$

$$= \frac{3 + \frac{1}{3}}{2} = \frac{10/3}{2} = \frac{10}{6} = \boxed{\frac{5}{3}}$$

3. **[8 points]** Evaluate the derivative of $y = \operatorname{sech}(\ln x)$.

$$y' = -\operatorname{sech}(\ln x)\tanh(\ln x) \cdot \frac{1}{x}$$