

Name: _____

due on Thursday 5 Mar

Quiz 10, sections 3.10, 3.11

1. (3 pts) Use a linear approximation to estimate
- $\sqrt{99.8}$

$$f(x) = \sqrt{x} \quad f'(x) = \frac{1}{2\sqrt{x}} \quad a = 100 \quad f(100) = 10$$

$$f'(100) = \frac{1}{20}$$

$$\sqrt{x} \approx 10 + \frac{1}{20}(x-100)$$

$$\sqrt{99.8} \approx 10 + \frac{1}{20}(-.2) = 9.99$$

2. (5 pts) A right circular cylinder has volume
- $V = \pi r^2 h$
- . Use differentials to estimate the maximum possible error in the calculation of the volume if the measured dimensions are
- $r = 3 \pm 0.2$
- m and
- $h = 10 \pm 0.3$
- m.

$$\text{calculated volume } V = \pi (3)^2 (10) = 90\pi$$

$$dV = 2\pi r h dr + \pi r^2 dh$$

$$|dV| \leq 2\pi r h (.2) + \pi r^2 (.3) = 2\pi \cdot 3 \cdot 10 \cdot 0.2 + \pi (3)^2 (.3)$$

$$= 12\pi + 2.7\pi$$

$$= 14.7\pi$$

$$\text{relative error} = \frac{dV}{V} \leq \frac{14.7\pi}{90\pi} = \overline{.163} = 16\%$$

3. (2 pts) Find the derivative of
- $f(x) = \sinh(\cosh(\ln x))$

$$f'(x) = [\cosh(\cosh(\ln x))] [\sinh(\ln x)] \left[\frac{1}{x}\right]$$