

Name: _____ / 25

There are 25 points possible on this quiz. No aids (book, calculator, etc.) are permitted. **Show all work for full credit.**

1. **[9 points]** (Related Rate Problem) The radius of a cylinder is increasing at a rate of 2 cm/s while the volume of the cylinder is increasing at a rate of $25\pi \text{ cm}^3/\text{s}$. How fast is the height of the cylinder changing when the radius is 5 cm and the height is 10 cm ? Interpret your answer using a complete sentence. Units should be included in your answer.

The volume of a cylinder is given by $V = \pi r^2 h$.

2. [8 points] (Linear Approximation and Differentials) Let $h(x) = 5 - 2 \sin(x - 3)$.

- a. Find the differential of $h(x)$.

- b. Find the differential of $h(x)$ when $x = 3$ and $dx = 0.12$. Express your answer as a decimal.

- c. Explain what the number in part (b) indicates about the function $h(x)$.

3. [8 points] Let $f(x) = (4 - x^2)^2$.

- a. Find all critical points for $f(x)$.

- b. Determine the absolute maximum and absolute minimum of $f(x)$ on the interval $[0, 3]$ or state that none exist. You must show your work to receive full credit. See the answer-blank below.

maximum value of $f(x)$: _____

minimum value of $f(x)$: _____