1. $\sqrt{25.02}$ $\quad x = 25.02$, $a = 25$ $\quad f(x) = \sqrt{x}$, $f'(x) = \frac{1}{2\sqrt{x}}$

$$\approx \sqrt{25} + \frac{1}{2\sqrt{25}}(.02) = 5 + \frac{1}{500} = \boxed{\frac{2501}{500}}$$

2. $\sqrt[3]{63.97}$ $\quad x = 63.97$, $a = 64$ $\quad f(x) = \sqrt[3]{x}$, $f'(x) = \frac{1}{3x^{\frac{2}{3}}}$

$$\approx \sqrt[3]{64} + \frac{(63.97-64)}{3(64)^{\frac{2}{3}}} = 4 - \frac{.03}{3(16)} = 4 - \frac{1}{1600}$$

$$= \boxed{\frac{6399}{1600}}$$

3. $V = \frac{4}{3}\pi r^3$ $\quad r = 5$, $dr = .01$ $\quad dV = 4\pi r^2 dr$

$$= 4\pi(25)(.01) = \boxed{\pi \text{ mm}^3}$$

4. $\sin(46°)$ $\quad x = 46°$, $a = 45°$ $\quad f(x) = \sin x$, $f'(x) = \cos x$

↗ degree to radian conversion

$$\approx \sin 45° + \cos(45°)\left[46° - 45°\right]\left(\frac{\pi}{180}\right)$$

$$= \frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2}\left(1\right)\left(\frac{\pi}{180}\right) = \boxed{\frac{\sqrt{2}}{2} + \frac{\pi\sqrt{2}}{360}}$$