1. Use a linear approximation to estimate the value of each of the following. 
*You must express your answer as a single exact rational number.*

(a) $e^{0.1}$

(b) $\ln(1.04)$

(c) $\frac{1}{\sqrt{25}}$

(d) $(\sec\left(\frac{\pi}{4} - 0.02\right))^2$

2. A manufacturer’s total cost (in dollars) when the level of production is $q$ units is

$$C(q) = q^5 - 2q^3 + 3q^2 - 2$$

The current level of production is 3 units, and the manufacturer is planning to increase this to 3.01 units. Estimate how the total cost will change as a result.

3. A manufacturer’s total cost (in dollars) when the level of production is $q$ units is

$$C(q) = 3q^2 + q + 500$$

(a) What is the exact cost of manufacturing the 41st unit?

(b) Use marginal analysis to estimate the cost of manufacturing the 41st unit.

4. You measure the radius of a sphere to be 6 inches, and then you use your measurement to calculate the volume of the sphere with the formula $V = \frac{4}{3} \pi r^3$. If your measurement of the radius is accurate to within 1%, approximately how accurate (to the nearest percent) is your calculation of the volume?