1. Write down the linear approximation formula in variable form.

2. Use an appropriate linearization to approximate the value of the following terms.
   a. \( \sin (3) \)
   b. \( e^{0.06} \)
   c. \( \sqrt[3]{65} \)

3. Estimate the amount of paint needed to paint a sphere with a coat that is 2 mm thick. The radius of the sphere is 2 m.

4. A surveyor, standing 50 feet from a building, measures the angle of elevation to the top of the building to be 50°. How accurately must the angle be measured for the percentage error in estimating the height of the building to be less than 3%?

5. What are the steps while sketching the curve of a function?

6. Without using a calculator, sketch each of the following curves.
   a. \( f(x) = \frac{x^3}{3} - 400x \)
   b. \( f(x) = e^{-x^2} \)
   c. \( f(x) = \frac{10x^3}{x^2 - 1} \)
   d. \( f(x) = x^2 \ln (x) \)

7. A rancher has 400 feet of fence for constructing a rectangular corral. One side of the corral will be formed by a barn and requires no fence. Three exterior fences and two interior fences partition the corral into three rectangular regions. What dimensions of the corral maximize the enclosed area? What is the area of that corral?
8. Suppose an airline policy states that all baggage must be box-shaped with a sum of length, width, and height not exceeding 64 inches. What are the dimensions and volume of a square-based box with the greatest volume under these conditions?

9. Of all boxes with a square base and a volume of 100 m$^3$, which one has the minimum surface area?

10. Write down a formula for estimating the root of any function.

11. Approximate the root of the following functions.
   a. $f(x) = x^3 - 5x + 1$
   b. $f(x) = e^x - 5$
   c. $f(x) = \ln(x + 1) - 1$
   d. $f(x) = \tan(x) - 2x$

12. Find the antiderivative of the following functions.
   a. $f(x) = 5x^4$
   b. $f(x) = 3\sec^2(x)$
   c. $f(x) = -4\cos(4x)$
   d. $f(x) = -6x^{-7}$
   e. $f(x) = \csc^2(6x)$

13. Find the antiderivative that satisfies the given conditions.
   a. $f(x) = x^5 - 2x^{-2} + 1$ for $F(1) = 0$
   b. $f(x) = \sec(x)\tan(x)$ for $F(0) = 2$
   c. $f(x) = \sec^2(x)$ for $F\left(\frac{\pi}{4}\right) = 1$

14. A softball is popped up with a velocity of 30 m/s, find the time and the height the ball reaches the highest point.

15. A stone is thrown vertically upward with a velocity of 30 m/s from the edge of a cliff 200 m above a river. Find the time and the height the ball reaches the highest point.