1. Find the linear function $L(n)$ that best approximates $\tan((45 + n)^\circ)$ when $n$ is close to 0.
2. A circular table top is measured to be 6 ft in diameter, using an old measuring tape whose markings could be off by as much as \( \frac{1}{2} \) inch. Suppose this measurement is used to calculate the area of the table. Use differentials to estimate the largest possible error in the determination of the area.
3. A water balloon is dropped from a hovering United Nations helicopter. The balloon’s velocity $v$ (measured in feet per second, in the downward direction) obeys the equation

$$v'(t) = 32 - 0.2v(t).$$

At $t = 4$ seconds, the balloon’s velocity is 88 feet per second. Use differentials or a linear approximation to approximate the balloon’s velocity at $t = 4.5$ seconds.
4. Let \( f(x) = x^3 - 6x^2 + 9x - 4 \). Find the absolute maximum and minimum values of \( f \) on the interval \([0, 5]\).
5. Sketch the graph of a function \( f \) satisfying the following:

- \( f \) is continuous on \([0, 4]\)
- \( f \) has a local maximum at 1
- \( f \) is not differentiable at 1, but is differentiable at all other points in \((0, 4)\)
- \( f \) has an absolute maximum at 3
- the absolute minimum value of \( f \) is 1.

(Two grids are provided; one is for practice. Be sure to indicate which grid contains your final answer.)
6. Let \( f(x) = \cos x - 3x \).

   (a) Prove that \( f \) has at least 1 root.
(b) Prove that $f$ has at most one root.