1. Find the tangent line approximation of $\frac{1}{3x}$ near $x = 1$.

2. Compute the linear approximation of $\sqrt{x+3}$ around 6. Use it to estimate $\sqrt{9.5}$.

3. Find and identify all critical points and inflection points for the functions below:
   
   (a) $h(x) = x^5 - 10x^3 - 8$;
   
   (b) $g(x) = x + \frac{1}{x}$;
   
   (c) $f(x) = (x^2 - 4)^7$.

4. Find the slope of the line tangent to the curve defined by $x^3 + 5x^2y + 2y^2 = 4y + 11$ at the point $(1, 2)$.

5. Find the tangent line to the curve defined by $\ln(xy) = 2x$ at the point $(1, e^2)$.

6. Find $y''$ if $x^2 + xy + y^2 = 1$.

7. **Challenging:** Try to find the slope of the tangent line to the curve defined by $x^2 + y^2 = 1$ at the points $(-1, -1)$ and $(1/\sqrt{2}, -1/\sqrt{2})$ in two different ways. Is something wrong somewhere, and why? And is there a third way to do it? And a fourth? How many of those methods can you use at $(1, 0)$?

8. **[T/F]** Decide if the following statements are true or false. Explain (or give a counterexample for) each answer.
   
   (a) If a point $P$ is critical for a function $f$, then $f'(P) = 0$.
   
   (b) If the linear approximation of a function $f$ at a point $P$ is a horizontal line, then $f$ has either a maximum or a minimum in $P$.
   
   (c) If a function $f$ has continuous non-constant second derivative and two maxima in an interval, then it also has a minimum in that interval.