Section 3.11: Linearization and Differentials.

If a function $f(x)$ is differentiable at $x = a$, then the approximating function below is called the **Linearization of f at a.**

$$L(x) = f(a) + f'(a)(x - a)$$

Use this equation to compute the linearization of the following functions. Then use it to estimate the given values.

1. $f(x) = \sqrt{x}$. Estimate $f(9.01)$.

2. $f(x) = x + \dfrac{1}{x}$. Estimate $f(1.03)$.

3. $g(x) = \dfrac{1}{x^2}$. Estimate $g(0.2)$.

4. $h(x) = \sqrt[3]{x}$. Estimate $h(26.5)$.

5. Let $f(u) = (1 + u)^k$ for some real number k. Determine the linearization of $f(u)$ at $u = 0$.

6. Using your formula from #5, create an approximation function for the given functions below for values of x near zero.

   a. $f(x) = (1 - x)^7$

   b. $f(x) = \dfrac{7}{x + 1}$

   c. $f(x) = \sqrt{4 + 4x}$

   d. $f(x) = \sqrt{9 + x^2}$

   e. $f(x) = \sqrt[3]{2 - 5x}$