

Keeper 5.1 Virtual Problems

Definition – Linearization

If f is differentiable at $x = a$, then the equation of the tangent line

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

Defines the linearization approximation of f at a . The point $x = a$ is the center of the approximation.

Examples

1. Find the linearization of $f(x) = \sqrt{1-x}$ at $x = 0$, and use it to approximate $\sqrt{1.02}$ without a calculator. Check the accuracy of your estimate on your calculator.
2. Find the linearization of $f(x) = \cos x$ at $x = \frac{\pi}{2}$ and use it to approximate $\cos(1.75)$ without a calculator.
3. Find the linearization of $y = x + \frac{1}{x}$ at $x = 1$. Explain what your answer tells you about the function.
4. Use linearization to approximate $\sqrt{68}$.

Independent Practice

Linearly approximate the following number. In each case, determine an appropriate function $f(x)$ and a point $(a, f(a))$ where the tangent line meets the graph. Determine if your linear approximation (also known as local linearization) overestimates or underestimates the true value.

1. $\tan 3.1$

2. $\sqrt[3]{28}$

3. $\sqrt{9.2}$

4. $\sin 0.2$

5. $16.1^{\frac{1}{4}}$