

# Linear approximation

After completing this section, students should be able to do the following.

- Define linear approximation as an application of the tangent to a curve.
- Find the linear approximation to a function at a point and use it to approximate the function value.
- Identify when a linear approximation can be used.
- Label a graph with the appropriate quantities used in linear approximation.
- Find the error of a linear approximation.
- Compute differentials.
- Use the second derivative to discuss whether the linear approximation over or underestimates the actual function value.
- Contrast the notation and meaning of  $dy$  versus  $\Delta y$ .
- Understand that the error shrinks faster than the displacement in the input.
- Justify the chain rule via the composition of linear approximations.