

Find the linearization of each function:

a) $h(x) = x^4 - 3x^2 - 1$ at $a = -1$.

b) $f(x) = \sin^2(x)$ at $a = \frac{\pi}{2}$.

c) $g(x) = \frac{1}{(1 + 3x)^4}$ at $a = 0$.

d) $r(t) = t^{\frac{3}{4}}$ at $a = 16$.

Use a linear approximation to estimate the value of $\sqrt[3]{9}$.

Use a linear approximation to estimate the value of $\tan(44^\circ)$.

The line tangent to the graph of $f(x) = \sin(x)$ at the point $(0, 0)$ is $y = x$. This implies that

- a) $\sin(0.0005) \approx 0.0005$
- b) The line $y = x$ touches the graph of $f(x) = \sin(x)$ at exactly one point, $(0, 0)$.
- c) $y = x$ is the best straight line approximation to the graph of f for all x .

Peeling an orange changes its volume V . What does ΔV represent?

- a) the volume of the rind.
- b) the surface area of the orange.
- c) the volume of the "edible part" of the orange.
- d) $-1 \times$ (the volume of the rind).

Imagine that you increase the dimensions of a square with side x_1 to a square with side length x_2 . The change in the area of the square, ΔA , is approximated by the differential dA . Find dA :

a) $2x_1(x_2 - x_1)$

b) $2x_2(x_2 - x_1)$

c) $x_1^2 - x_2^2$

d) $(x_2 - x_1)^2$

Imagine that you increase the dimensions of a square with side x_1 to a square with side length x_2 . The change in the area of the square, ΔA , is approximated by the differential

$$dA = 2x_1(x_2 - x_1)$$

This approximation will result in an

- a) overestimate
- b) underestimate
- c) exactly equal

Find the differential of each function:

a) $y = \sqrt{1 + x^2}$

c) $y = \sec(\sqrt{7x})$

b) $y = x^2 \sin(x)$

d) $y = \frac{3 - t^2}{3 + t^2}$

The radius of a sphere is measured to be 84 inches with a possible error of 0.5 inches.

- a) Use differentials to estimate the maximum error in the calculated surface area. What is the relative error?

- b) Use differentials to estimate the maximum error in the calculated volume. What is the relative error?

Use differentials to estimate the amount of paint needed to apply a coat of paint 0.1 cm thick to hemispherical dome with diameter 50 meters.

A window has the shape of a square surmounted by a semicircle.

The base of the window is measured as having width 50 inches with a possible error in measurement of 0.1 inches.

Use differentials to estimate the maximum error possible in computing the area of the window. What is the maximum relative error?