

## 3.10: Linear Approximation & Differentials

3.10

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Q: How might you approx  $\sqrt{8}$  and  $\sqrt{7.5}$  on a desert isle?

Ex1:  $f(x) = \sqrt{x} \Rightarrow f'(x) = \frac{1}{2\sqrt{x}}$  and  $f'(9) = \frac{1}{6}$

Tangent line:  $y - 3 = \frac{1}{6}(x - 9)$

$$\Rightarrow f(x) \approx \frac{1}{6}(x - 9) + 3$$

$$f'(9)(x - 9) + f(9)$$

$f(8) \approx \frac{17}{6}$  and  $f(9.5) \approx \frac{37}{12}$ .

Look AT  
THE GRAPH

Tip:  $\Delta x = dx = b - a$

$\Delta y$  exact change in  $y$ -vals:  $y(b) - y(a)$

$dy$  approx change in  $y$ -vals:  $dy = f'(a) dx$ .

Ex2: Suppose  $y = \cos x$ ,  $x = \frac{\pi}{3}$ ,  $dx = 0.05$

(a) find  $dy$

(b) evaluate  $dy$  for the given  $x$  &  $dx$ .

(c) evaluate  $\Delta y$ .

Ex3: Use differentials to estimate the amt. of paint needed to apply a coat of paint \_\_\_\_\_ thick to a hemispherical dome w/ diameter 50m.

Ex4: Estimate  $\frac{1}{1002}$  w/ differentials.