tangent line approx.

7. $\sqrt[3]{1-x} \approx 1 - \frac{1}{3}x$

$y \rightarrow x = 0$

(0, 1)

$y = \sqrt[3]{1-x} = (1-x)^{1/3}$

$y' = \frac{1}{3}(1-x)^{-2/3}(-1)\Big|_{x=0} = \frac{-1}{3}$

eq. of tangent line

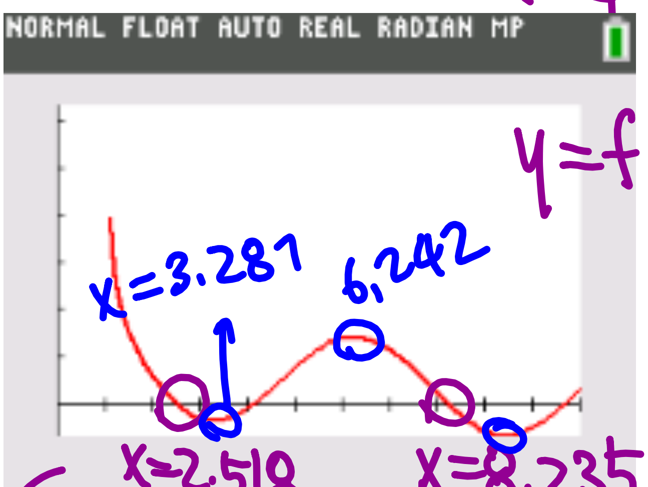
$y - 1 = \frac{-1}{3}(x - 0)$

$y = 1 - \frac{1}{3}x$

12/11

Let $y = \sin x + 2\sqrt{x-1}$ $[1, 10]$

Find rel max & PoI



$y = f'(x)$

$x = 3.287$ 6.242

$x = 2.518$ $x = 8.235$

rel max

PoI: $x = 3.287, 6.242,$

Approx.

$\sqrt{4.02} \rightarrow y = \sqrt{x}$

$x = 4.02$

tangent line at $(4,2)$

$y' = \frac{1}{2\sqrt{x}}\Big|_{x=4} = \frac{1}{4}$

$y - 2 = \frac{1}{4}(x - 4)$

$y - 2 = \frac{1}{4}(4.02 - 4)$

$y - 2 = .005$

$y = \boxed{2.005}$

35. The circumference of a sphere was measured to be 84 cm with a possible error of 0.5 cm.

(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?

$r = \frac{84}{2\pi} = \frac{42}{\pi}$ $\quad 2\pi r = 84 \qquad \Delta C = .5$

$C = 2\pi r$

$\frac{dC}{dr} = 2\pi$

$dC = 2\pi\, dr$

$.5 = 2\pi\, dr$

$\frac{.5}{2\pi} = dr$

$SA = 4\pi r^2$

$\frac{dSA}{dr} = 8\pi r$

$dSA = \underbrace{8\pi r}\, dr$

$= \frac{\cancel{4}(84)(\cancel{.5})}{\cancel{2}\pi}$

$dSA = \frac{84}{\pi}$

$V = \frac{4}{3}\pi r^3$

$\frac{dV}{dr} = 4\pi r^2$

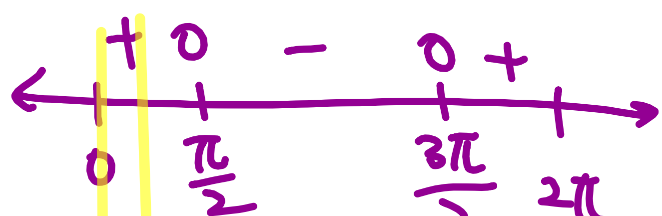
$dV = 4\pi r^2 dr = \cancel{4}\cancel{\pi}\left(\frac{42}{\pi}\right)^2 \frac{\cancel{.5}}{\cancel{2\pi}} = \frac{1764}{\pi^2}$

39. $y = e^{\sin x}$ $\quad [0, 2\pi]$

y-int: $e^{\sin 0} = 1 = y$

x-int: $e^{\sin x} \neq 0$: none

$y' = \cos x \, e^{\sin x} = 0 \to x = \frac{\pi}{2}, \frac{3\pi}{2}$



$$y'' = -\sin x \, e^{\sin x} + \cos^2 x \, e^{\sin x}$$

$$= e^{\sin x}\underbrace{(\cos^2 x - \sin x)}_{0}$$

$x = .666$

2.475