$$\sqrt{(\cos x - 5)^2} \sin x$$

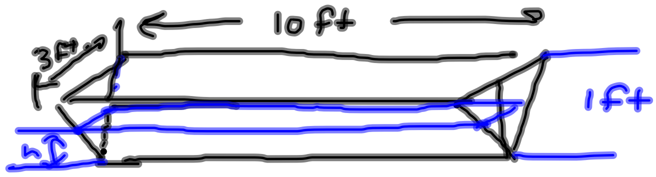
$$\sqrt{x^2} = |x|$$

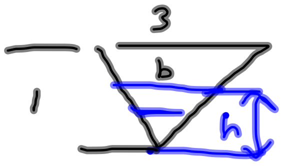
$$= |\cos x - 5| \sin x$$

$$= (5 - \cos x) \sin x$$

Feb 23-12:04 PM

3.8 #24





$\frac{3}{1} = \frac{b}{h} \Rightarrow$

$3h = b$

$\frac{dV}{dt} = 12 \frac{ft^3}{min}$

$V = \frac{1}{2} bh \cdot 10$

$= \frac{1}{2} \cdot 3h^2 \cdot 10$

$= 15h^2$

Find $\left.\frac{dh}{dt}\right|_{h=6'' = .5 ft}$

$V = 15h^2$

$12 = \left.\frac{dV}{dt}\right|_{h=\frac{1}{2}} = 30h \left.\frac{dh}{dt}\right|_{h=\frac{1}{2}} = 30(\tfrac{1}{2}) \frac{dh}{dt}$

$\left.\frac{dh}{dt}\right|_{h=.5} = \frac{4}{5}$ ft/min.

$2zz' = 2xx' + 2yy'$

$= 2(5)(2) + 2(12)(3)$

Verify that $L_0(x) = -8x+1$ for

$f(x) = (2x+1)^{-4}$

$f'(x) = -4(2x+1)^{-5}(2) = -\frac{8}{(2x+1)^5} \Longrightarrow$

$f'(0) = -8 = m_{tan} \Longrightarrow$

$y = L_0(x) = -8(x-0) + f(0)$

$= -8x+1$ ✓

What range of values will keep $L_0(x)$ within 0.1 units of $f(x)$ itself?

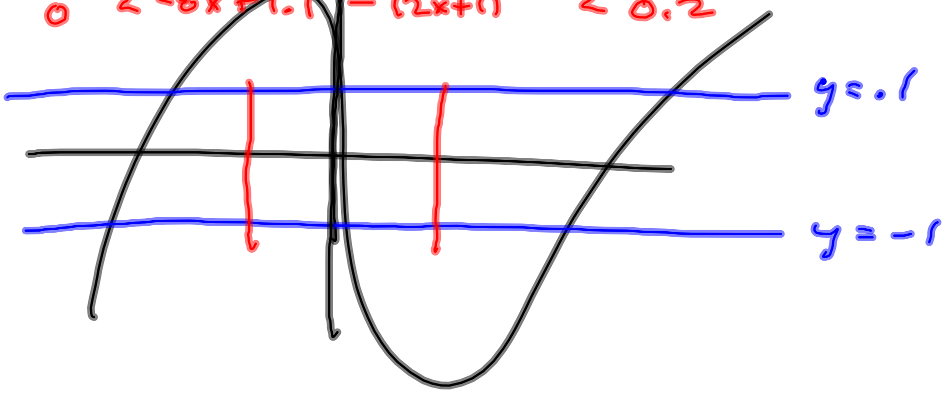
WANT

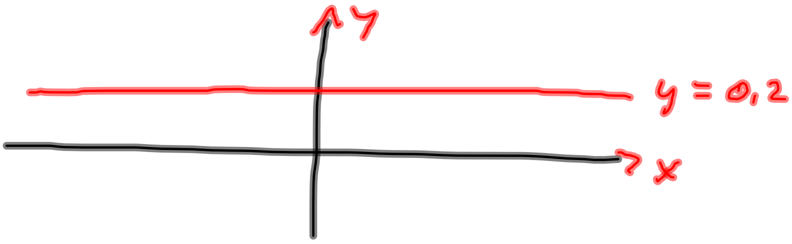
$$\left| -8x+1 - (2x+1)^{-4} \right| < .1$$

$$-.1 < \underbrace{-8x+1-(2x+1)^{-4}}_{G(x)} < .1$$

$$\overset{+.1}{0} \overset{=}{<} \overset{+.1}{-8x+1.1} - (2x+1)^{-4} \overset{=+.1}{<} 0.2$$

One way.





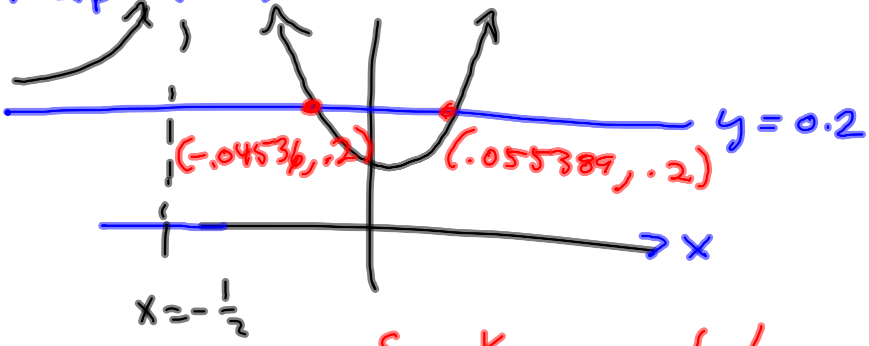
Here's how I did it.

$$\left| \frac{1}{(1+2x)^4} - (1-8x) \right| < .1$$

$$-.1 < \frac{1}{(1+2x)^4} - 1 + 8x < .1$$

$$0 < \frac{1}{(1+2x)^4} - .9 + 8x < .2$$

Keep this between 0 & .2.



So keep x between $-.045$ & $+.055$ & you'll be OK.

$$(5-\cos x)^2 = (\cos x - 5)^2$$

$$(1+2x)^3 = (2x+1)^3$$

$*$ $\underline{L_a(x) = f(a) + f'(a)(x-a) \approx f(x)}$

$\sqrt{98}$

to approximate $f(x)$

$\Delta y = f(x) - f(a)$

$*$ $\underline{dy = f'(a)(x-a) \approx \Delta y}$

To approximate Δy

#6 on 3.9 sucked in hindsight.

$\sqrt[3]{1+x}$

To approximate $\sqrt[3]{.95}$, isn't it easier to use $g(x) = \sqrt[3]{x}$ & $a = 1$

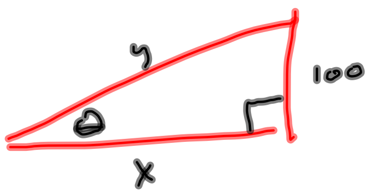
Version of #6

$f(x) = \sqrt[3]{x} = x^{\frac{1}{3}} \Longrightarrow f'(x) = \frac{1}{3}x^{-\frac{2}{3}}$

$a = 1$, then $f(a) = 1$, $f'(a) = \frac{1}{3}(1)^{-\frac{2}{3}} = \frac{1}{3}$

$$
\begin{aligned}
f(x) &\approx f(a) + f'(a)(x-a) \\
&= 1 + \left(\tfrac{1}{3}\right)(.95 - 1) \\
&= 1 + \left(\tfrac{1}{3}\right)(-.05) \\
&= 1 - \left(\tfrac{1}{3}\right)\left(\tfrac{5}{100}\right) = 1 - \left(\tfrac{1}{3}\right)\left(\tfrac{1}{20}\right) \\
&= \frac{60-1}{60} = \frac{59}{60} \approx \sqrt[3]{.95}
\end{aligned}
$$

Feb 23-12:56 PM



$$\frac{dx}{dt} = 8\ \frac{ft}{s}$$

want $\left.\frac{d\theta}{dt}\right|_{y=200}$

Scratch

$y = 200 \rightarrow$

$$x = \sqrt{200^2 - 100^2}$$
$$= \sqrt{(200-100)(200+100)}$$
$$= \sqrt{100\,(300)}$$
$$= \sqrt{30000} = 100\sqrt{3}$$

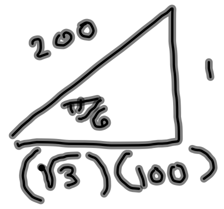
$$\tan\theta = \frac{100}{x}$$

$$\sec^2\theta\,\frac{d\theta}{dt} = -100x^{-2}\,\frac{dx}{dt}$$

$$\cancel{\left(\frac{\sqrt{3}}{2}\right)^2}\,\frac{d\theta}{dt} = \frac{-100}{(100\sqrt{3})^2}\cdot 8$$

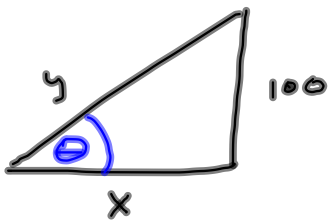
No!

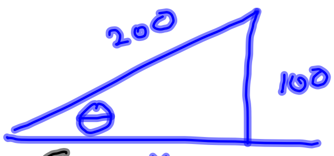
$$\cancel{\frac{3}{4}}\,\frac{d\theta}{dt} = -\frac{1}{300}\cdot 8$$



$$\frac{d\theta}{dt} = \frac{-8}{300}\cdot\cancel{\frac{4}{3}}$$

$$= \cancel{-\frac{32}{900}} = \cancel{-\frac{16}{450}} = \cancel{-\frac{8}{225}} =$$





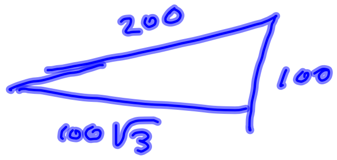
$100\sqrt{3} = x$

$\sqrt{200^2 - 100^2} = 100\sqrt{3}$

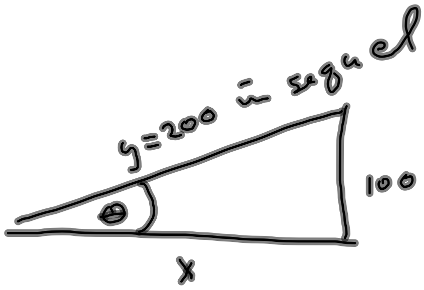
$$\cot\theta = \frac{x}{100}$$

$$-\csc^2\theta \frac{d\theta}{dt} = \frac{1}{100}\frac{dx}{dt}$$

$$-4\frac{d\theta}{dt} = \frac{1}{100}\frac{dx}{dt}$$



$$\frac{d\theta}{dt} = -\frac{1}{400}\cdot 8 = -\frac{2}{100} = -\frac{1}{50}$$



$x = 100\sqrt{3}$, when
$y = 200$

$$\tan\theta = \frac{100}{x}$$

$$\sec^2\theta \, \frac{d\theta}{dt} = -\frac{100}{x^2}\cdot\frac{dx}{dt}$$

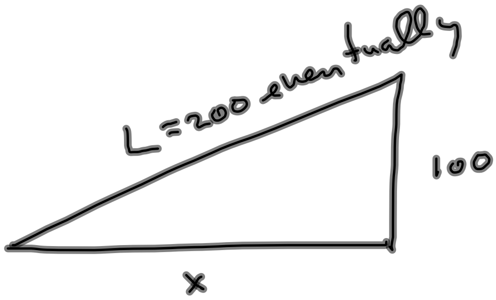
$$\frac{x}{y} = \frac{100\sqrt{3}}{200} = \frac{\sqrt{3}}{2}$$

$$\left(\frac{2}{\sqrt{3}}\right)^2 \frac{d\theta}{dt} = -\frac{100}{(100\sqrt{3})^2}\cdot 8$$

$$\frac{4}{3}\cdot\frac{d\theta}{dt} = -\frac{1}{100\cdot 3}\cdot 8$$

$$\frac{d\theta}{dt} = -\frac{\cancel{8}^{\,2}}{\cancel{300}_{\,100}}\cdot\frac{\cancel{3}^{\,1}}{\cancel{4}} = -\frac{2}{100} = -\frac{1}{50}$$

Feb 23-1:26 PM



$$\frac{d}{dt}\left[\frac{x}{L}\right] = \frac{x'L - xL'}{L^2}$$

$$\frac{100\sqrt{3}}{200} = \frac{\sqrt{3}}{2}$$

$$\tan\theta = \frac{100}{x}$$

$$\cot\theta = \frac{x}{100}$$

$$\sec^2\theta \frac{d\theta}{dt} = -\frac{100}{x^2}\cdot\frac{dx}{dt}$$

$$-\csc^2\theta = \frac{1}{100}\frac{dx}{dt}$$

$$\frac{200}{}$$