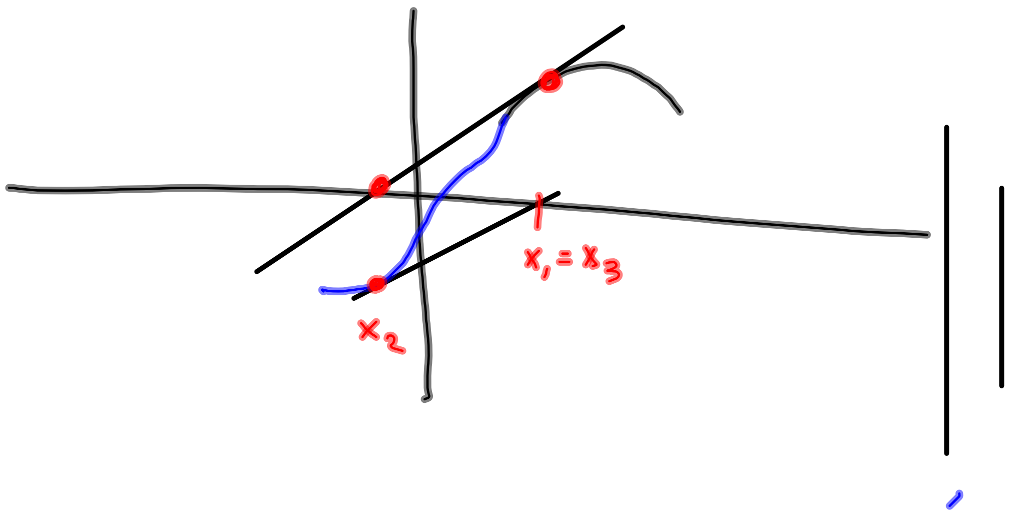
§4.6 3 probs w/ excel

#18, 14, 10



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Excel for Newton's method will
be in the notes for today
121018-newtons-demo-excel
121018-newtons-demo-video

On the project, Do this with your excel:
Alt-prntscrn
paste to paint
select.
paste into worksheet.

$$\frac{d}{dx}\sin x = \cos x \qquad \int \cos x \, dx = \sin x + C$$

The antiderivative of $\cos x$ is THE FAMILY OF FUNCTIONS $\{\sin x + C \mid C \in \mathbb{R}\}$

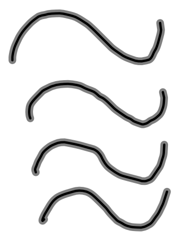
which we represent as $\sin x + C$.

$$\sin x + 7 \in \{\sin x + C \mid C \in \mathbb{R}\},$$

so is $\sin x - 11$, $\sin x + 22\pi$, ...

$$\frac{d}{dx}[\sin x - 5] = \cos x$$

$$\frac{d}{dx}[\sin x + 22\pi] = \cos x$$



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$$\int x^n\,dx = \frac{x^{n+1}}{n+1} + C$$

$$\frac{d}{dx}\left[\frac{x^{n+1}}{n} + C\right]$$

$$= \frac{(n+1)\,x^n}{n} = \frac{n+1}{n}x^n \neq x^n$$ Newp.

$$\int x^5\,dx = \frac{1}{6}x^6 + C$$

$$\int \sin x\,dx = -\cos x + C$$

Chain Rule wrt $\int * dx$

$$\frac{d}{dx}\left[\sin(5x)\right] = 5\cos(5x)$$

$$\int \cos(5x)\,dx = \frac{1}{5}\sin(5x) + C$$

Chain Rule in Reverse

$$\frac{d}{dx}\left[\sin(x^2-5x)\right] = (2x-5)\cos(x^2-5x)$$

This means

$$\int \cos(x^2-5x)\cdot(2x-5)\,dx$$

$$= \sin(x^2-5x) + C$$

$\cos(x^2-5x) = \cos u$, where $u = x^2-5x$

$$\frac{d}{dx}\left[\cos(u(x))\right] = \frac{d}{du}(\cos(u(x))\cdot\frac{d}{dx}\cdot u(x)$$

$$= \frac{d}{d(x^2-5x)}(\cos(x^2-5x))\cdot\frac{d}{dx}\left[x^2-5x\right]$$

$$= \sin(x^2-5x)\cdot(2x-5)$$

$u = x^2-5x$

$du = (2x-5)\,dx$

$$\int \cos(x^2-5x)\cdot(2x-5)\,dx$$

$$= \int \cos u\,du = \sin u + C = \sin(x^2-5x) + C$$

$$\int \sin(5x)\,dx$$

$$= \frac{1}{5}\int \sin(5x)\cdot 5\,dx$$

$$= \frac{1}{5}\boxed{\int \sin u\,du}, \text{ where } u = 5x$$
$$du = 5\,dx$$

$$= \frac{1}{5}(-\cos u) + C$$

$$= -\frac{1}{5}\cos(5x) + C$$

This one sucks.

$$\int (x^2+7x)^{3/5}\,dx \quad \text{dunno.}$$

This one's nice

$$\int (x^2+7x)^{3/5}(2x+7)\,dx \quad \text{we can do it}$$

$$= \int u^{3/5}\,du, \text{ where } u = x^2+7x$$

$$= \frac{5}{8}u^{\frac{8}{5}} + c = \frac{5}{8}(x^2+7x)^{3/5} + C$$

$$\int \text{intergrand}$$

$$\int \frac{\csc\theta}{\csc\theta - \sin\theta}\, d\theta = \tan\theta + C$$

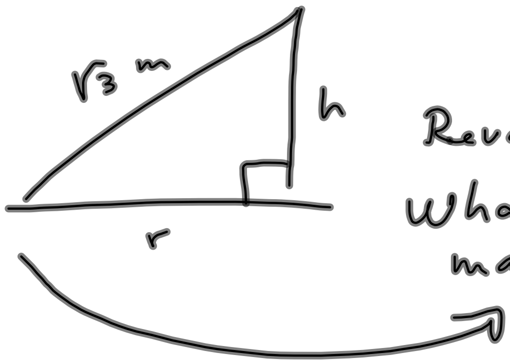
Play: $\dfrac{\frac{1}{\sin\theta}}{\frac{1}{\sin\theta} - \sin\theta} = \dfrac{1}{\sin\theta}\left(\dfrac{1}{\frac{1-\sin^2\theta}{\sin\theta}}\right)$

$$= \frac{1}{\sin\theta}\left(\frac{\sin\theta}{1-\sin^2\theta}\right) = \frac{1}{\cos^2\theta} = \sec^2\theta$$

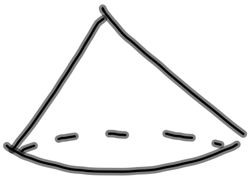
$$\frac{\csc\theta}{\csc\theta - \sin\theta} = \frac{\csc^2\theta}{\csc^2\theta - \csc\theta\sin\theta}$$

$$= \frac{\csc^2\theta}{\csc^2\theta - 1} = \frac{\csc^2\theta}{\cot^2\theta} = \frac{\frac{1}{\sin^2\theta}}{\frac{\cos^2\theta}{\sin^2\theta}}$$

$$= \ \dots \ = \sec^2\theta$$



Revolve to make a Cone
What h & r will maximize volum



Let's maximize the area of the triangle

$h^2 + r^2 = 3$

$A = \frac{1}{2} r h$

$h = \sqrt{3-r^2} = (3-r^2)^{\frac{1}{2}}$

$A = \frac{1}{2} r (3-r^2)^{\frac{1}{2}}$

$$\frac{dA}{dr} = \frac{1}{2}(3-r^2)^{\frac{1}{2}} + \frac{1}{2} r \left(\cancel{\tfrac{1}{2}}(3-r^2)^{-\frac{1}{2}}\right)(-\cancel{2}r)$$

$$= \sqrt{3-r^2} \quad \frac{-r^2}{\sqrt{3-r^2}}$$

$$= \frac{3-r^2-r^2}{\sqrt{3-r^2}} = \frac{3-2r^2}{\sqrt{3-r^2}} \overset{\text{SET}}{=} 0$$

$$\Longrightarrow 2r^2 = 3$$

$$r = \pm\sqrt{\frac{3}{2}} = \pm\frac{\sqrt{6}}{2}$$

$$h = \sqrt{3-r^2} = \sqrt{3-\frac{3}{2}} = \sqrt{\frac{3}{2}} = \text{Sa}$$