

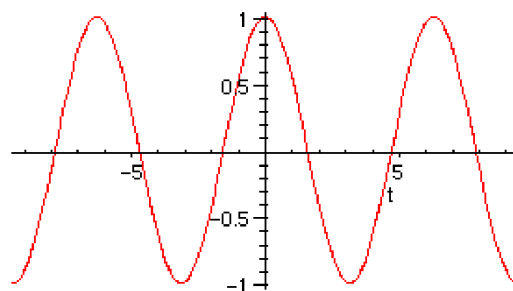
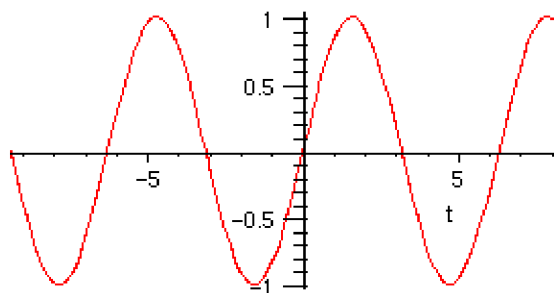
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 CALCULUS & ANALYTIC GEOMETRY I
 

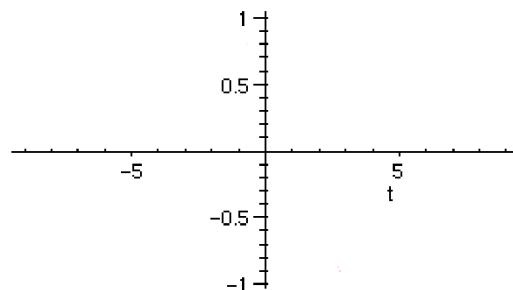
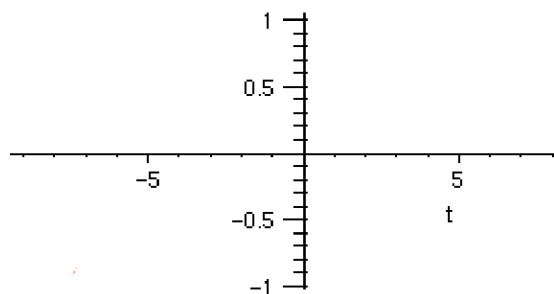
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## The Derivative: Analytic Viewpoint

Recall the graphs of your favorite trig functions...



Now sketch their derivative functions based on where they are increasing, decreasing, or have a slope of zero.



So we conjecture that

$$\frac{d}{dx} \sin x =$$

$$\frac{d}{dx} \cos x =$$

Apply this knowledge.

1. Find  $\frac{d}{d\theta} (\theta \sin \theta + \cos \theta)$ .

2. Find  $[(\sin t + \cos t)(\sin t - \cos t)]'$ .

3. Find the derivatives for the remaining trigonometric functions.

$$(\tan x)' =$$

$$(\sec x)' =$$

$$(\cot x)' =$$

$$(\csc x)' =$$

Last but not least, it is time to analytically verify that  $\frac{d}{dx} \sin x = \cos x$  and  $\frac{d}{dx} \cos x = -\sin x$ .

Recall the sum formulas:

$$\sin(x + h) = \sin(x) \cos(h) + \sin(h) \cos(x)$$

$$\cos(x + h) = \cos(x) \cos(h) - \sin(x) \sin(h)$$

$$\sin'(x) = \lim_{h \rightarrow 0} \frac{\sin(x + h) - \sin(x - h)}{2h}$$

$$\cos'(x) = \lim_{h \rightarrow 0} \frac{\cos(x + h) - \cos(x - h)}{2h}$$