

Differentiation Rules

$$y = f(u), \quad u = g(x), \quad v = h(x)$$

$$\frac{d}{dx} (u + v) = \frac{du}{dx} + \frac{dv}{dx}$$

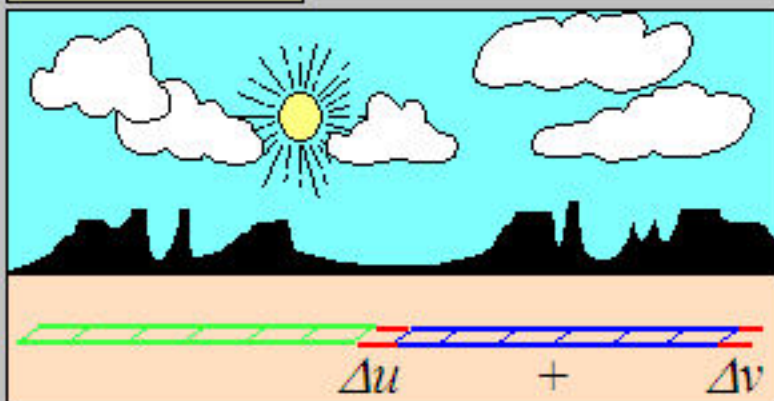
Ex1

$$\frac{d}{dx} (u v) = u \frac{dv}{dx} + v \frac{du}{dx}$$

$$\frac{d}{dx} \frac{u}{v} = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2}$$

$$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$$

Sum Rule



$$\Delta (u+v) = \Delta u + \Delta v$$

$$\frac{\Delta (u+v)}{\Delta x} = \frac{\Delta u}{\Delta x} + \frac{\Delta v}{\Delta x}$$

Taking the limit as Δx goes to 0

$$\frac{d(u+v)}{dx} = \frac{du}{dx} + \frac{dv}{dx}$$



Differentiation Rules

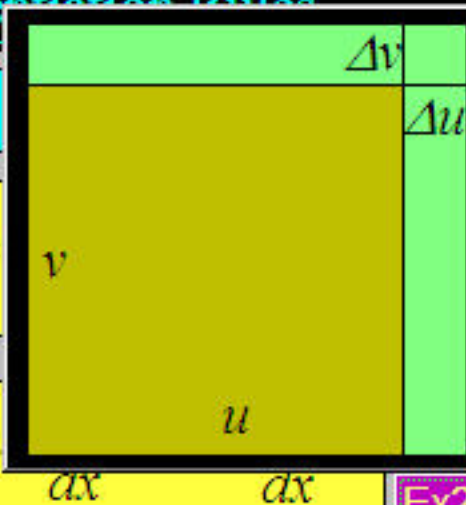
$$y = f(u),$$

$$\frac{d}{dx}(u + v) =$$

$$\frac{d}{dx}(uv) =$$

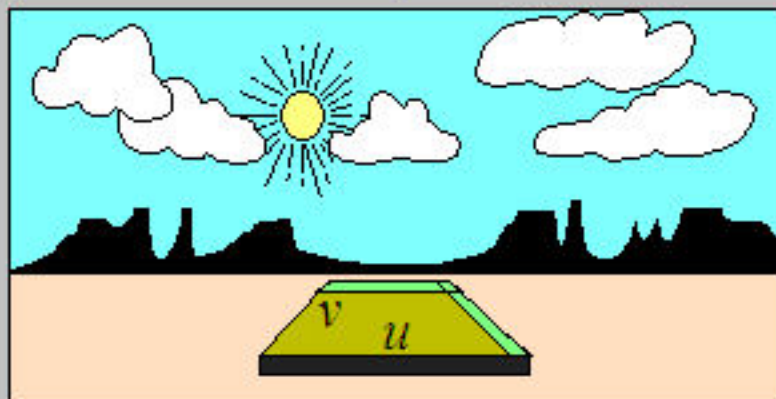
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Ex2

Product Rule



$$\Delta(uv) = u\Delta v + v\Delta u + \Delta u\Delta v$$

$$\frac{\Delta(uv)}{\Delta x} = u \frac{\Delta v}{\Delta x} + v \frac{\Delta u}{\Delta x} + \frac{\Delta u}{\Delta x} \Delta v$$



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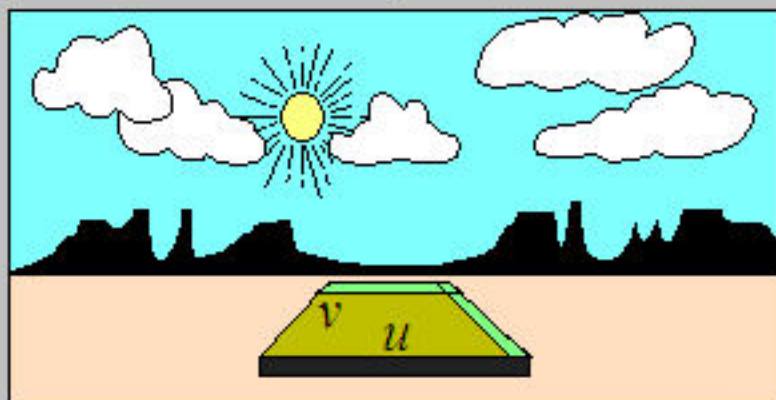
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Ex2

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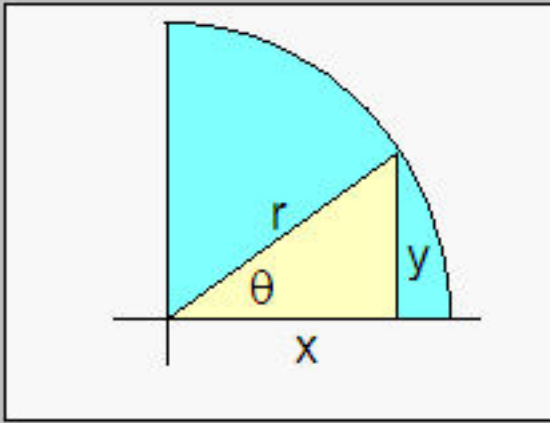
Taking the limit as Δx goes

$$\frac{d(uv)}{dx} = u \frac{dv}{dx} + v \frac{du}{dx}$$



Trigonometric Functions (1)

Brief Review



$$\sin \theta = y/r$$

$$\csc \theta = r/y$$

$$\cos \theta = x/r$$

$$\sec \theta = r/x$$

$$\tan \theta = y/x$$

$$\cot \theta = x/y$$

$$x = r \cos \theta$$

$$y = r \sin \theta$$

$$\sec \theta = \frac{1}{\cos \theta}$$

$$\tan \theta = \frac{\sin \theta}{\cos \theta}$$

$$\csc \theta = \frac{1}{\sin \theta}$$

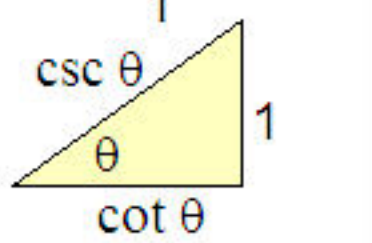
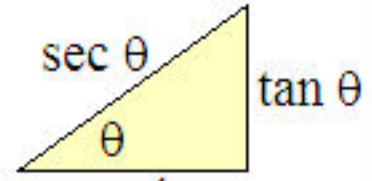
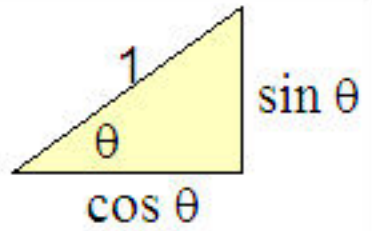
$$\cot \theta = \frac{\cos \theta}{\sin \theta}$$

$$\sin 0 = 0$$

$$\cos 0 = 1$$

$$\sin \pi/2 = 1$$

$$\cos \pi/2 = 0$$



$$\sin^2 \theta + \cos^2 \theta = 1$$

$$\tan^2 \theta + 1 = \sec^2 \theta$$

$$\cot^2 \theta + 1 = \csc^2 \theta$$

