

**Useful trig facts.**

$$\sin^2 \theta + \cos^2 \theta = 1, \quad \tan^2 \theta + 1 = \sec^2 \theta$$

$$\cos^2 \theta = \frac{1}{2}(1 + \cos 2\theta), \quad \sin^2 \theta = \frac{1}{2}(1 - \cos 2\theta)$$

$$\cos 2\theta = \cos^2 \theta - \sin^2 \theta, \quad \sin 2\theta = 2 \sin \theta \cos \theta$$

$$\sin \frac{\pi}{6} = \frac{1}{2}, \quad \sin \frac{\pi}{3} = \frac{\sqrt{3}}{2},$$

$$\cos \frac{\pi}{6} = \frac{\sqrt{3}}{2}, \quad \cos \frac{\pi}{3} = \frac{1}{2},$$

$$\sin \frac{\pi}{4} = \cos \frac{\pi}{4} = \frac{\sqrt{2}}{2}$$

**Some derivatives.**

$$\frac{d}{dx} b^x = \ln(b)b^x$$

$$\frac{d}{dx} \sin(x) = \cos(x)$$

$$\frac{d}{dx} \cos(x) = -\sin(x)$$

$$\frac{d}{dx} \tan(x) = (\sec(x))^2$$

$$\frac{d}{dx} \csc(x) = -\csc(x) \cot(x) \quad \frac{d}{dx} \sec(x) = \sec(x) \tan(x) \quad \frac{d}{dx} \cot(x) = -(\csc(x))^2$$

**Fundamental Theorem of Calculus, part I.**

If  $f$  is continuous on  $[a, b]$ , then function  $g$  defined as

$$g(x) = \int_a^x f(t) dt, \quad a \leq x \leq b$$

satisfies  $g'(x) = f(x)$ .

**Fundamental Theorem of Calculus, part II.**

If  $f$  is continuous on  $[a, b]$ , then

$$\int_a^b f(x) dx = F(b) - F(a)$$

where  $F$  is any anti-derivative of  $f$  (ie.  $F$  is any function such that  $F' = f$ ).

**Integration by parts fomula.**

$$\int u dv = uv - \int v du$$