Algebraic

- $a^2 - b^2 = (a-b)(a+b)$ • $\sqrt{x} = x^{\frac{1}{2}}$, $\frac{1}{x} = x^{-1}$
- $a^3 - b^3 = (a-b)(a^2 + ab + b^2)$
- Quadratic Formula: $\dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Geometric

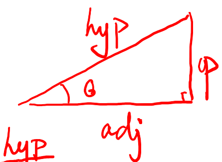
- Area of Circle: πr^2
- Circumference of Circle: $2\pi r$
- Circle with center (h, k) and radius r:

$$(x-h)^2 + (y-k)^2 = r^2$$

- Distance from (x_1, y_1) to (x_2, y_2):

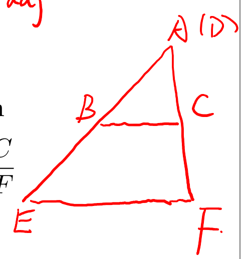
$$\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

- Area of Triangle: $\frac{1}{2}bh$
- $\sin\theta = \dfrac{\text{opposite leg}}{\text{hypotenuse}}$
- $\cos\theta = \dfrac{\text{adjacent leg}}{\text{hypotenuse}}$ • $\sec\theta = \frac{1}{\cos\theta} = \frac{hyp}{adj}$
- $\tan\theta = \dfrac{\text{opposite leg}}{\text{adjacent leg}}$



- If $\triangle ABC$ is similar to $\triangle DEF$ then

$$\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$$

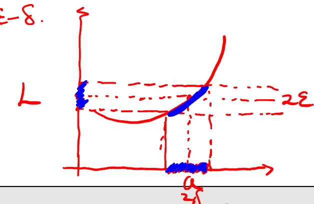


- Volume of Sphere: $\frac{4}{3}\pi r^3$
- Surface Area of Sphere: $4\pi r^2$
- Volume of Cylinder/Prism: (height)(area of base)
- Volume of Cone/Pyramid: $\frac{1}{3}$(height)(area of base)

Trigonometric

- $\sin^2\theta + \cos^2\theta = 1$
- $\sin(2\theta) = 2\sin\theta\cos\theta$
- $$\begin{aligned}\cos(2\theta) &= \cos^2\theta - \sin^2\theta \\ &= 1 - 2\sin^2\theta \\ &= 2\cos^2\theta - 1\end{aligned}$$

• graph of ε-δ.



Limits

(ε-δ def of limit)

- $\lim_{x\to a} f(x) = L$ if for every $\varepsilon > 0$ there exists $\delta > 0$ so that $|f(x) - L| < \varepsilon$ when $|x - a| < \delta$.
- $\lim_{x\to a} f(x)$ exists if and only if

$$\lim_{x\to a^-} f(x) = \lim_{x\to a^+} f(x)$$

- $\lim_{\theta\to 0} \dfrac{\sin\theta}{\theta} = 1$
- $\lim_{\theta\to 0} \dfrac{1-\cos\theta}{\theta} = 0$

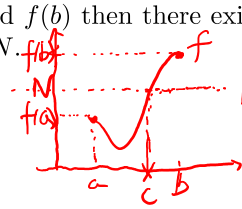
Derivatives

- $f'(x) = \lim_{h\to 0} \dfrac{f(x+h) - f(x)}{h}$ Definition of $f'(x)$.
- $(fg)' = f'g + fg'$
- $\left(\dfrac{f}{g}\right)' = \dfrac{f'g - fg'}{g^2}$
- $(f(g(x)))' = f'(g(x)) \cdot g'(x)$ = out'(inn)·inn', f outer, g inner
- $(\sin x)' = \cos x$ • $(x^n)' = n\cdot x^{n-1}$
- $(\cos x)' = -\sin x$ • $(const)' = 0$; $(ax+b)' = a$.
- $(\tan x)' = \sec^2 x$
- $(\sec x)' = \sec x \cdot \tan x$

Theorems

- (IVT) If f is continuous on $[a, b]$, $f(a) \neq f(b)$, and N is between $f(a)$ and $f(b)$ then there exists $c \in (a, b)$ that satisfies $f(c) = N$.

graph of IVT.



N = f(c).

★ Point slope: $y - b = k\cdot(x-a) \Leftrightarrow y = k(x-a) + f(a)$

★ Point slope for tangent line of $f(x)$ at a:

$y = f'(a)\cdot(x-a) + f(a)$.

Functions of motion:

$V_{ave} = \dfrac{S(t_2) - S(t_1)}{t_2 - t_1}$, $V(t) = S'(t)$, $a(t) = V'(t)$.

speed $= |V(t)|$.