

Algebraic

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

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: $\frac{1}{2}bh$
- $\sin \theta = \frac{\text{opposite leg}}{\text{hypotenuse}}$
- $\cos \theta = \frac{\text{adjacent leg}}{\text{hypotenuse}}$
- $\tan \theta = \frac{\text{opposite leg}}{\text{adjacent leg}}$
- 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

- $\sin^2 \theta + \cos^2 \theta = 1$
- $\sin(2\theta) = 2 \sin \theta \cos \theta$
- $\cos(2\theta) = \cos^2 \theta - \sin^2 \theta$
 $= 1 - 2 \sin^2 \theta$
 $= 2 \cos^2 \theta - 1$
- Table of Trig Values

| x | 0 | $\pi/6$ | $\pi/4$ | $\pi/3$ | $\pi/2$ |
|-----------|---|--------------|--------------|--------------|---------|
| $\sin(x)$ | 0 | 1/2 | $\sqrt{2}/2$ | $\sqrt{3}/2$ | 1 |
| $\cos(x)$ | 1 | $\sqrt{3}/2$ | $\sqrt{2}/2$ | 1/2 | 0 |
| $\tan(x)$ | 0 | $\sqrt{3}/3$ | 1 | $\sqrt{3}$ | DNE |

Limits

- $\lim_{x \rightarrow a} f(x)$ exists if and only if $\lim_{x \rightarrow a^-} f(x) = \lim_{x \rightarrow a^+} f(x)$
- $\lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} = 1$
- $\lim_{\theta \rightarrow 0} \frac{1 - \cos \theta}{\theta} = 0$

Derivatives

- $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$
- $(\cot x)' = -\csc^2 x$
- $(\csc x)' = -\csc x \cdot \cot x$

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 $f(c) = N$.
- (MVT) If f is continuous on $[a, b]$ and differentiable on (a, b) then there exists $c \in (a, b)$ that satisfies $f'(c) = \frac{f(b) - f(a)}{b - a}$.
- (FToC P1) If $F(x) = \int_a^x f(t) dt$ then $F'(x) = f(x)$.

Other Formulas

- Newton's Method: $x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$
- $\sum_{i=1}^n c = cn$
- $\sum_{i=1}^n i = \frac{n(n+1)}{2}$
- $\sum_{i=1}^n i^2 = \frac{n(n+1)(2n+1)}{6}$