Volumes and areas. Sphere of radius r: $V = \frac{4}{3}\pi r^3,\ A = 4\pi r^2$.
Cylinder of radius r and height h: $V = \pi r^2 h,\ A = 2\pi r^2 + 2\pi r h$.
Cone of base radius r and height h: $V = \frac{1}{3}\pi r^2 h,\ A = \pi r\sqrt{r^2+h^2}$.

Equation of a circle and line. The equation of a circle of radius r centred at the point (a, b) is $(x-a)^2 + (y-b)^2 = r^2$.
The slope of a line through the points $P_1(x_1, y_1)$ and $P_2(x_2, y_2)$ is $m = \frac{y_2 - y_1}{x_2 - x_1}$.
The equation of a line with slope m through the point $P_1(x_1, y_1)$ is $y - y_1 = m(x - x_1)$.

Summations.

$$\sum_{i=1}^{n} i = \frac{n(n+1)}{2}, \quad \sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}, \quad \sum_{i=1}^{n} i^3 = \frac{n^2(n+1)^2}{4}$$

Trigonometric identities.

$$1 = \sin^2(x) + \cos^2(x), \quad 1 + \tan^2(x) = \sec^2(x), \quad 1 + \cot^2(x) = \csc^2(x)$$

$$\sin(x+y) = \sin(x)\cos(y) + \cos(x)\sin(y), \quad \sin(x-y) = \sin(x)\cos(y) - \cos(x)\sin(y)$$

$$\cos(x+y) = \cos(x)\cos(y) - \sin(x)\sin(y), \quad \cos(x-y) = \cos(x)\cos(y) + \sin(x)\sin(y)$$

$$\tan(x+y) = \frac{\tan(x) + \tan(y)}{1 - \tan(x)\tan(y)}, \quad \tan(x-y) = \frac{tan(x) - \tan(y)}{1 + \tan(x)\tan(y)}$$

$$\cos(2x) = \cos^2(x) - \sin^2(x) = 2\cos^2(x) - 1 = 1 - 2\sin^2(x)$$

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

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

Inverse trigonometric functions.

$$\sin^{-1}(y) = x \iff x = \sin(y) \text{ and } -\frac{\pi}{2} \le x \le \frac{\pi}{2}$$

$$\cos^{-1}(y) = x \iff x = \cos(y) \text{ and } 0 \le x \le \pi$$

$$\tan^{-1}(y) = x \iff x = \tan(y) \text{ and } -\frac{\pi}{2} < x < \frac{\pi}{2}$$

Useful trigonometric values.

θ	$\sin(\theta)$	$\cos(\theta)$
0	0	1
$\frac{\pi}{6}$	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$
$\frac{\pi}{4}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{2}}{2}$
$\frac{\pi}{3}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$
$\frac{\pi}{2}$	1	0

Derivatives of elementary functions. We assume that f and g are differentiable functions, and that the various combinations of functions are defined; a, b, c are real numbers.

$$\text{Linearity:}\quad \frac{d}{dx}\left(af(x)+bg(x)\right) = af'(x)+bg'(x)$$

$$\text{Chain rule:}\quad \frac{d}{dx}\left(f\circ g(x)\right) = f'\left(g(x)\right)g'(x)$$

$$\text{Product rule:}\quad \frac{d}{dx}\left((fg)(x)\right) = f(x)g'(x)+f'(x)g(x)$$

$$\text{Quotient rule:}\quad \frac{d}{dx}\left(\frac{f}{g}(x)\right) = \frac{g(x)f'(x)-f(x)g'(x)}{\left(g(x)\right)^2}$$

$$\text{Power rule:}\quad \frac{d}{dx}(x^n) = nx^{n-1}, \quad \frac{d}{dx}(c) = 0$$

$$\text{Exponential functions:}\quad \frac{d}{dx}\left(e^x\right) = e^x, \quad \frac{d}{dx}\left(b^x\right) = b^x\ln(b)$$

$$\text{Logarithmic functions:}\quad \frac{d}{dx}\left(\ln|x|\right) = \frac{1}{x}, \quad \frac{d}{dx}\left(\log_b(x)\right) = \frac{1}{x\ln(b)}$$

Trigonometric functions:

$$\frac{d}{dx}\left(\sin(x)\right) = \cos(x), \quad \frac{d}{dx}\left(\cos(x)\right) = -\sin(x), \quad \frac{d}{dx}\left(\tan(x)\right) = \sec^2(x)$$

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

Inverse trigonometric functions:

$$\frac{d}{dx}\left(\sin^{-1}(x)\right) = \frac{1}{\sqrt{1-x^2}}, \quad \frac{d}{dx}\left(\cos^{-1}(x)\right) = -\frac{1}{\sqrt{1-x^2}}, \quad \frac{d}{dx}\left(\tan^{-1}(x)\right) = \frac{1}{1+x^2}$$

$$\frac{d}{dx}\left(\csc^{-1}(x)\right) = -\frac{1}{x\sqrt{x^2-1}}, \quad \frac{d}{dx}\left(\sec^{-1}(x)\right) = \frac{1}{x\sqrt{x^2-1}}, \quad \frac{d}{dx}\left(\cot^{-1}(x)\right) = -\frac{1}{1+x^2}$$