1 Assumed Knowledge

1.1 Algebra

1.1.1 Completing the Square

$$x^2 + bx + c = (x + \frac{b}{2})^2 + c - (\frac{b}{2})^2$$

1.1.2 Polynomial Expansions

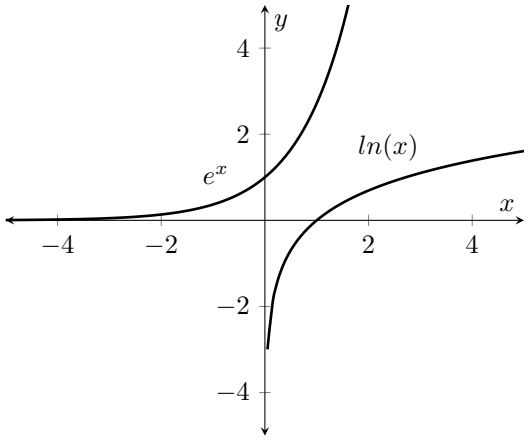
$$(a \pm b)^2 = a^2 \pm 2ab + b^2$$
$$a^2 - b^2 = (a + b)(a - b)$$
$$a^3 \pm b^3 = (a \pm b)(a^2 \mp 2ab + b^2)$$

1.1.3 Partal Fractions

$$\frac{f(x)}{(ax + b)(cx + d)}$$
$$= g(x) + \frac{A}{ax + b} + \frac{B}{cx + d}$$
$$\frac{f(x)}{(ax + b)(cx + d)^2}$$
$$= g(x) + \frac{A}{ax + b} + \frac{B}{cx + d} + \frac{C}{(cx + d)^2}$$
$$\frac{f(x)}{(ax + b)(x^2 + c)}$$
$$= g(x) + \frac{A}{ax + b} + \frac{Bx + C}{x^2 + c)}$$

1.1.4 Exponent and Logarithm

$$e^n = \underbrace{e \times e \times e \times ... \times e}_{\text{n times}}$$
$$e^{\frac{1}{2}} = \sqrt{e}$$
$$log_e(x) = ln(x)$$
$$= \text{how many times } e \text{ is multiplied by itself to get x}$$
$$log_{10}(x) = lg(x)$$
$$x = e^{ln(x)}$$
$$log_x(y) = \frac{log_{base}(y)}{log_{base}(x)}$$



1.2 Trigonometry

1.2.1 Sine and Cosine Rule

For any triangle with length of sides a, b and c and with opposite angles A B and C:

$$\frac{a}{sin(A)} = \frac{b}{sin(B)} = \frac{c}{sin(C)}$$
$$a^2 = b^2 + c^2 - 2bccos(A)$$
$$cos(A) = \frac{b^2 + c^2 - a^2}{2bc}$$

1.2.2 Sum of Angles

$$sin(A \pm B) = sin(S)cos(B) \pm cos(A)sin(B)$$
$$sin(2A) = 2sin(A)cos(A)$$
$$cos(A \pm B) = cos(A)cos(B) \mp sin(A)sin(B)$$
$$\begin{aligned} cos(2A) &= cos^2(A) - sin^2(A) \\ &= 2cos^2(A) - 1 \\ &= 1 - 2sin^2(A) \end{aligned}$$
$$tan(A \pm B) = \frac{tan(A) \pm tan(B)}{1 \mp tan(A)tan(B)}$$
$$tan(2A) = \frac{2tan(A)}{1 - tan^2(A)}$$
$$\text{Area of Triangle} = \tfrac{1}{2}absin(C)$$

1.2.3 Factor and Reverse Factor Formula

$$sin(A) + sin(B) = 2sin(\frac{A+B}{2})cos(\frac{A-B}{2})$$
$$sin(A) - sin(B) = 2cos(\frac{A+B}{2})sin(\frac{A-B}{2})$$
$$cos(A) + cos(B) = 2cos(\frac{A+B}{2})cos(\frac{A-B}{2})$$
$$cos(A) - cos(B) = -2sin(\frac{A+B}{2})sin(\frac{A-B}{2})$$
$$sin(A)cos(B) = \frac{1}{2}[sin(A+B) - sin(A-B)]$$