Rules:

$$\int (x^n)\,dx = \frac{x^{n+1}}{x+1} + c$$

$$\int (\sin nx)\,dx = \frac{1}{n}\cos nx + c$$

$$\int (\cos nx)\,dx = -\frac{1}{n}\sin nx + c$$

$$\int (\sin^2 nx)\,dx = \frac{1}{2}\int (1-\cos 2nx)\,dx$$

$\sin^2 A = \frac{1}{2}(1-\cos 2A)$

$$\int (\cos^2 nx)\,dx = \frac{1}{2}\int (1+\cos 2nx)\,dx$$

$\cos^2 A = \frac{1}{2}(1+\cos 2A)$

$$\int e^{nx}\,dx = \frac{1}{n}e^{nx} + c$$

THE SYLLABUS

Integral calculus:
Integration techniques (integrals of sums, multiplying constants, and substitution) applied to:

a. x^n
b. $\sin nx$, $\cos nx$, $\sin^2 nx$, $\cos^2 nx$;
c. e^{nx}
d. functions of the form:

$$\frac{1}{x+a},\ \frac{1}{a^2+x^2},\ \frac{1}{\sqrt{(a^2-x^2}},\ \sqrt{(a^2-x^2}.$$

Definite integrals with applications to areas and volumes of revolution (confined to cones and spheres).

do each part of a sum separately

eg $\int (3x^2+1)\,dx = \int 3x^2\,dx + \int 1\,dx = x^3 + x + c$

Integration techniques (integrals of sums, multiplying constants, and substitution) applied to:

move multiplying constants outside Integral

Substitute expression with u to simplify.
- also change 'dx' for 'du term'.
- also change limits.

eg. $\int 4\sin x\,dx = 4\int \sin x\,dx$
$= 4(-\cos x) + c = -4\cos x + c$

Definite integrals with applications to areas and volumes of revolution (confined to cones and spheres).

Generating Areas :

$$A = \int_a^b y.dx$$

Area between curve and x-axis

$$A = \int_a^b x.dy$$

Area between curve and y-axis

Generating Volumes

$$V = \pi \int_a^b y^2 \, dx$$

Rotating about x-axis

$$V = \pi \int_a^b x^2 \, dy$$

Rotating about y-axis

$$\int \frac{1}{\sqrt{a^2 - x^2}} \, dx = \sin^{-1}\left(\frac{x}{a}\right) + c$$

IN LOG TABLES

let $u = x + a$

d. functions of the form:

$$\frac{1}{x+a}, \; \frac{1}{a^2+x^2}, \; \frac{1}{\sqrt{(a^2-x^2)}}, \; \sqrt{(a^2-x^2)}.$$

$$\int \frac{1}{a^2+x^2} \, dx = \frac{1}{a} \tan^{-1}\left(\frac{x}{a}\right) + c$$

IN LOG TABLES

let $x = a \sin u$

special case: $$\int \frac{f'(x)}{f(x)} \, dx = \ln x + c$$