List of formula.

1. $\sin\alpha + \sin\beta = 2\sin\left(\frac{\alpha+\beta}{2}\right).\cos\left(\frac{\alpha-\beta}{2}\right)$.

2. $\sin\alpha - \sin\beta = 2\cos\left(\frac{\alpha+\beta}{2}\right).\sin\left(\frac{\alpha-\beta}{2}\right)$.

3. $\cos\alpha + \cos\beta = 2\cos\left(\frac{\alpha+\beta}{2}\right).\cos\left(\frac{\alpha-\beta}{2}\right)$.

4. $\cos\alpha - \cos\beta = -2\sin\left(\frac{\alpha+\beta}{2}\right).\sin\left(\frac{\alpha-\beta}{2}\right)$.

5. $\sinh at = \frac{e^{at} - e^{-at}}{2}$

6. $\cosh at = \frac{e^{at} + e^{-at}}{2}$.

7. $\sin at = \frac{e^{iat} - e^{-iat}}{2i}$.

8. $\cos at = \frac{e^{iat} + e^{-iat}}{2}$.

* Even fun^{c} :-

If $f(-x) = f(x)$, then $f(x)$ is called even fun^{c}.

Exa :- x^2, $\cos x$, x^4, ------

* odd fun^{c} :-

If $f(-x) = -f(x)$ then $f(x)$ is called an odd fun^{c}.

Exa :- x^3, $\sin x$, $x + x^3$, ----

* $\int e^{at} \sin bt \, dt$

$= \frac{e^{at}}{a^2+b^2} [a \sin bt - b \cos bt]$.

* $\int e^{at} \cos bt \, dt$.

$= \frac{e^{at}}{a^2+b^2} [a \cos bt + b \sin bt]$.

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* Integration by parts:

$$\int u \cdot v \, dx = u \int v \, dx - \int \left[\frac{du}{dx} \int v \, dx \right]$$

choice of u & v is as per

LIATE.

L → logarithm fun → $\log x, \log 2x, \ldots$

I → Inverse fun → $x^{-1}, \sin^{-1}x, \cos^{-1}x$

A → Algebric fun → $x, x^2+x^3, \ldots$

T → Trigonometric fun

E → exponential fun → $e^x, e^2, \ldots$

* General form of Integration by parts

$$\int uv \, dx = uv_1 - u'v_2 + u''v_3 - u'''v_4 + u''''v_5 - \ldots$$

$u', u'', u''', \ldots$ are derivatives of u.

$v_1, v_2, v_3, \ldots$ are Integration of v.

* $\sin(\alpha \pm \beta) = \sin\alpha\cos\beta \pm \sin\beta\cos\alpha$.
* $\cos(\alpha \pm \beta) = \cos\alpha\cos\beta \mp \sin\alpha\sin\beta$.
* $\sin 2\theta = 2\sin\theta \cdot \cos\theta$.
* $\sin 3\theta = 3\sin\theta - 4\sin^3\theta$.
* $\cos 3\theta = 4\cos^3\theta - 3\cos\theta$.
* $\cos(-x) = \cos x$, $\sin(-x) = -\sin x$.

→ $\sin 0 = 0$, $\sin\frac{\pi}{2} = 1$, $\sin\pi = 0$,
$\sin 2\pi = 0$, $\cos\pi = -1$, $\cos 2\pi = 1$.
$\cos 0 = 1$, $\cos\frac{\pi}{2} = 0$.
$\cos n\pi = (-1)^n$, $\cos 2n\pi = 0$.
$\sin n\pi = 0$, $\sin 2n\pi = 0$.
$\cos(2n \pm 1)\pi = (-1)$.
$e^{i\theta} = \cos\theta + i\sin\theta$.
$\sin(2n \pm 1)\pi = 0$.