Q7. Given $\int e^x(\tan x + 1)\sec x\,dx = e^x f(x) + c$.

Write $f(x)$ satisfying above equation.

Answer: Given $\int e^x(\tan x + 1)\sec x\,dx = e^x f(x) + c \ldots\ldots\ldots\ldots (1)$

L.H.S. = $\int e^x(\tan x + 1)\sec x\,dx$

$= \int e^x(\sec x + \sec x \tan x)\,dx$

$= \int e^x \sec x\,dx + \int e^x \sec x\ \tan x\,dx$

Integrating first by parts, $\int uvdx = u\int vdx - \int\left[\frac{du}{dx}\int vdx\right]dx, here\ u = \sec x, v = e^x$

$= e^x \sec x - \int e^x \sec x\ \tan x\,dx + \int e^x \sec x\ \tan x\,dx + c$

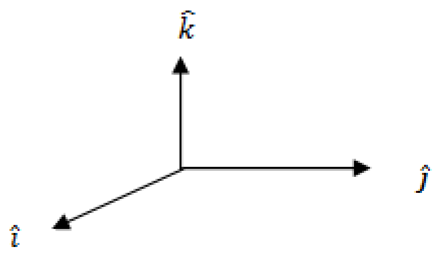
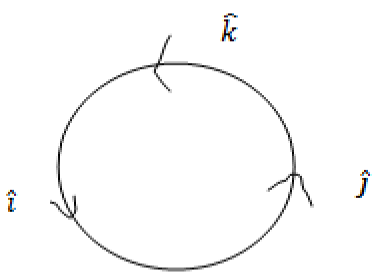
$= e^x \sec x + c$

$= e^x f(x) + c \qquad [By\ (1)]$

On comparing, we get $f(x) = \sec x$.

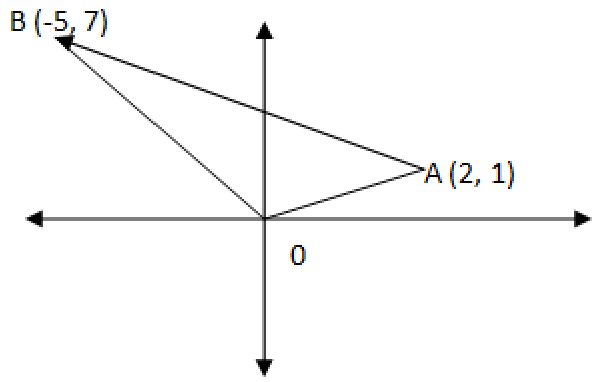
Q8. Write the value of $(\hat{\imath} \times \hat{\jmath}).\hat{k} + \hat{\imath}.\hat{\jmath}$.

Answer:

  $\hat{\imath} \times \hat{\jmath} = \hat{k}$	We know that $\vec{a} \times \vec{b} = absin\theta\hat{n}$ And $\vec{a}.\vec{b} = abcos\theta$ Dot product of unlike unit vector is zero as θ=90^0. Therefore $(\hat{\imath} \times \hat{\jmath}).\hat{k} + \hat{\imath}.\hat{\jmath} = \hat{k}.\hat{k} + \hat{\imath}.\hat{\jmath}$ = 1 + 0 = 1.

Q9. Find the scalar components of the vector $\overrightarrow{AB}$ with initial point A (2, 1) and terminal point B (-5, 7).

Answer:



From the figure drawn we have

Vector $\overrightarrow{AB} = \overrightarrow{AO} + \overrightarrow{OB} = -\overrightarrow{OA} + \overrightarrow{OB}$

$= -(2\hat{\imath} + \hat{\jmath}) + (-5\hat{\imath} + 7\hat{\jmath})$

$= -7\hat{\imath} + 6\hat{\jmath}$

Hence the scalar components are -7 and 6.

Q10. Find the distance of the plane 3x – 4y +12z = 3 from the origin.

Answer:

We know that perpendicular distance of

$(x_1\,, y_1, z_1)\ from\ plane\ ax + by + cz + d = 0\ is$

$$\left|\frac{ax_1 + by_1 + cz_1 + d}{\sqrt{a^2 + b^2 + c^2}}\right|$$

Therefore Perpendicular distance from the origin (0, 0, 0) and the plane 3x – 4y +12z – 3 = 0.

$= \left|\frac{3\times0-4\times0+12\times0-3}{\sqrt{3^2+(-4)^2+12^2}}\right| = \frac{3}{13}$