EXERCISE 22.4

Question. 1

Solution:

From the question it is given that,

Function, $y = \log x$

Now, differentiate with respect x,

$dy/dx = 1/x$

By cross multiplication we get,

$x\,(dy/dx) = 1$

Therefore, $y = \log x$ is a solution of the equation.

Then, $x = 1$

So, $y = \log (1) = 0$

Hence, $y(1) = 0$

Question. 2

Solution:

From the question it is given that,

Function, $y = e^x$

Now, differentiate with respect x,

$dy/dx = e^x$

$dy/dx = y$ [given $y = e^x$]

Therefore, $y = e^x$ is a solution of the equation.

Then, $x = 0$

So, $y = e^0 = 1$

Hence, $y(0) = 1$

Question. 3

Solution:

From the question it is given that,

Function, $y = \sin x$ … [equation (i)]

Now, differentiate with respect x,

$dy/dx = \cos x$ … [equation (ii)]

Then, the above equation is again differentiating with respect to x we get,

$d^2y/dx^2 = -\sin x$

From equation (i) $y = \sin x$

So,

$d^2y/dx^2 = - y$
Transposing we get,
$d^2y/dx^2 + y = 0$
Therefore, y = sin x is a solution of the equation.
Then, substitute x = 0 in equation (i)
So, y = sin (0)
y = 0
Hence, y(0) = 0
Now, substitute x = 0 in equation (ii)
dy/dx = cos (0)
dy/dx = 1
Hence, (dy/dx) (0) = 1

Question. 4
Solution:
From the question it is given that,
Function, $y = e^x + 1$ … [equation (i)]
Now, differentiate with respect x,
$dy/dx = e^x$
From equation (i), $y = e^x + 1$
Then, $e^x = y - 1$
dy/dx = y - 1 … [equation (ii)]
Then, the above equation is again differentiating with respect to x we get,
$d^2y/dx^2 = dy/dx$
Transposing we get,
$(d^2y/dx^2) – (dy/dx) = 0$
Therefore, $y = e^x + 1$ is a solution of the equation.
Then, substitute x = 0 in equation (i)
So, $y = e^0 + 1$
y = 1 + 1
y = 2
Hence, y(0) = 0
Now, substitute x = 0 in equation (ii)
$dy/dx = e^0 = 1$
dy/dx = 1
Hence, (dy/dx) (0) = 1

Question. 5

Solution:

From the question it is given that,

Function, $y = e^{-x} + 2$ … [equation (i)]

Now, differentiate with respect x,

$dy/dx = - e^{-x}$

From equation (i), $y = e^{-x} + 2$

Then, $e^{-x} = y - 2$

$dy/dx = - (y - 2)$

$dy/dx = -y + 2$

Transposing we get,

$(dy/dx) + y = 2$

Then, the above equation is again differentiating with respect to x we get,

$d^2y/dx^2 = dy/dx$

Transposing we get,

$(d^2y/dx^2) – (dy/dx) = 0$

Therefore, $y = e^{-x} + 2$ is a solution of the equation.

Then, substitute x = 0 in equation (i)

So, $y = e^0 + 2$

$y = 1 + 2$

$y = 3$

Hence, y(0) = 3