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3. Find the value of k, if $x-1$ is a factor of $p(x)$ in each of the following cases:

(i) $p(x) = x^2+x+k$

Solution:

If $x-1$ is a factor of $p(x)$, then $p(1) = 0$

By Factor Theorem

$$\Rightarrow (1)^2+(1)+k = 0$$

$$\Rightarrow 1+1+k = 0$$

$$\Rightarrow 2+k = 0$$

$$\Rightarrow k = -2$$

(ii) $p(x) = 2x^2+kx+\sqrt{2}$

Solution:

If $x-1$ is a factor of $p(x)$, then $p(1)=0$

$$\Rightarrow 2(1)^2+k(1)+\sqrt{2} = 0$$

$$\Rightarrow 2+k+\sqrt{2} = 0$$

$$\Rightarrow k = -(2+\sqrt{2})$$

(iii) $p(x) = kx^2-\sqrt{2}x+1$

Solution:

If $x-1$ is a factor of $p(x)$, then $p(1)=0$

By Factor Theorem

$$\Rightarrow k(1)^2-\sqrt{2}(1)+1=0$$

$$\Rightarrow k = \sqrt{2}-1$$

(iv) $p(x)=kx^2-3x+k$

Solution:

If $x-1$ is a factor of $p(x)$, then $p(1) = 0$

By Factor Theorem

$$\Rightarrow k(1)^2 - 3(1) + k = 0$$

$$\Rightarrow k - 3 + k = 0$$

$$\Rightarrow 2k - 3 = 0$$

$$\Rightarrow k = \frac{3}{2}$$