

$$\begin{aligned}
 3. \quad Q(x) &= (x-7)(x^2+2x+1) + (x-1)(x+1)^2 \\
 &= (x-7)(x+1)^2 + (x-1)(x+1)^2 \\
 &= (x+1)^2(x-7+x-1) \\
 \therefore Q(x) &= (x+1)^2(2x-8)
 \end{aligned}$$

$$4. a) E(x) = \frac{P(x)}{Q(x)} = \frac{3(x-1)(x+1)(x-4)}{(x+1)^2(2x-8)}$$

$(x+1)^2$ is strictly positive for all values of x in real no.s.
or $(x+1)^2 > 0 \quad \forall x \in \mathbb{R}$.

$$2x-8=0$$

$$\Rightarrow x = \frac{8}{2} = 4$$

So, $E(x)$ is defined for all real values of x except $x=4$

$$\text{or } D_f = \mathbb{R} - \{4\}.$$

$$E(x) = \frac{3(x-1)\cancel{(x+1)}\cancel{(x-4)}}{2(x+1)^2\cancel{(x-4)}}$$

$$\therefore E(x) = \frac{3(x-1)}{2(x+1)}$$

$$b) E(\sqrt{2}) = \frac{3(\sqrt{2}-1)}{2(\sqrt{2}+1)} = \frac{(3\sqrt{2}-3) \times (2\sqrt{2}-2)}{(2\sqrt{2}+2)(2\sqrt{2}-2)}$$

$$= \frac{12 - 6\sqrt{2} - 6\sqrt{2} + 6}{8-4}$$

$$= \frac{18 - 12\sqrt{2}}{4} = \frac{2(9-6\sqrt{2})}{4}$$

$$= \frac{9-6\sqrt{2}}{2}$$