Increasing and Decreasing Functions Ex 17.2 Q18
We have,

$$f(x) = (x-1)e^x + 1$$
$$\therefore \qquad f'(x) = e^x + (x-1)e^x$$
$$\Rightarrow \qquad f'(x) = e^x(1+x-1) = xe^x$$

Now,

$$x > 0$$
$$\Rightarrow \qquad e^x > 0$$
$$\Rightarrow \qquad xe^x > 0$$
$$\Rightarrow \qquad f'(x) > 0$$

Hence, $f(x)$ is an increasing function for all $x > 0$.

Increasing and Decreasing Functions Ex 17.2 Q19
We have,

$$f(x) = x^2 - x + 1$$
$$\therefore \qquad f'x = 2x - 1$$

Now,

$$x \in (0,1)$$
$$\Rightarrow \qquad 2x - 1 > 0 \text{ if } x > \frac{1}{2}$$
$$\text{and} \qquad 2x - 1 < 0 \text{ if } x < \frac{1}{2}$$
$$\Rightarrow \qquad f'(x) > 0 \text{ if } x > \frac{1}{2}$$
$$\text{and} \qquad f'(x) < 0 \text{ if } x < \frac{1}{2}$$

Thus, $f(x)$ is neither increasing nor decreasing on $(0,1)$.

Increasing and Decreasing Functions Ex 17.2 Q20

We have,

$$f(x) = x^9 + 4x^7 + 11$$

$$f'(x) = 9x^8 + 28x^6$$

$$= x^6 \left(9x^2 + 28\right)$$

Now,

$$x \in R$$

$$\Rightarrow \quad x^6 > 0 \text{ and } 9x^2 + 28 > 0$$

$$\Rightarrow \quad x^6 \left(9x^2 + 28\right) > 0$$

$$\Rightarrow \quad f'(x) > 0$$

Thus, $f(x)$ is an increasing function for $x \in R$.

Increasing and Decreasing Functions Ex 17.2 Q21

We have,

$$f(x) = x^3 - 6x^2 + 12x - 18$$

$$\therefore \quad f'(x) = 3x^2 - 12x + 12$$

$$= 3\left(x^2 - 4x + 4\right)$$

$$= 3(x - 2)^2$$

Now,

$$x \in R$$

$$\Rightarrow \quad (x - 2)^2 > 0$$

$$\Rightarrow \quad 3(x - 2)^2 > 0$$

$$\Rightarrow \quad f'(x) > 0$$

Thus, $f(x)$ is on increasing function for $x \in R$.

********** END *********