

Q1. Polynomial

Answer: 1 2
3 4
5 6
7 8

$f(1) = 2$

$f(3) = 4$

$f(5) = 6$

$f(7) = 8$

The polynomial that will represent function 'f' such that the values will be taken up as given is

$$(7-1)(7-3)(7-5) \cdot \frac{(x-1)(x-5)(x-7)}{16/4} + \frac{(x-1)(x-3)(x-5)}{(48/8)}$$

$$= 6 \times 4 \times 2 \cdot \frac{(x-1)(x-5)(x-7)}{16/4} + \frac{(x-1)(x-3)(x-5)}{(48/8)}$$

$$= 48$$

$$(3-1)(3-5)(3-7) + \frac{(x-1)(x-3)(x-7)}{-16/6} + \frac{(x-3)(x-5)(x-7)}{-48/2}$$

$$= 2 \times -2 \times -4$$

$$(5-1)(5-3)(5-7)$$

$$= 4 \times 2 \times -2$$

$$(1-3)(1-5)(1-7)$$

$$= -2 \times -4 \times -6$$

(2) e^{10x} Taylor's series.

$$f(x) = e^{10x} \quad f(0) = e^{10 \times 0} = e^0 = 1$$

$$f'(x) = 10e^{10x} \Rightarrow f'(0) = 10 \times e^{10 \times 0} = 10$$

$$f''(x) = 10^2 e^{10x} \Rightarrow f''(0) = 100 \times e^{10 \times 0} = 100$$

$$f^{(9)}(x) = 10^9 e^{10x} \Rightarrow f^{(9)}(0) = 10^9 \times e^{10 \times 0} = 10^9$$

$$f^{(10)}(x) = 10^{10} e^{10x} \Rightarrow f^{(10)}(0) = 10^{10} \times e^{10 \times 0} = 10^{10}$$

$$a_0 = 1, a_1 = 10, a_2 = 100, \dots, a_{10} = 10^{10}$$