

7. b) Expand $\tan^{-1}x$ in power of $(x-1)$.

Solⁿ - $f(x) = \tan^{-1}x$

$$f(1+x-1) = f(1) + \frac{(x-1)}{1!} f'(1) + \frac{(x-1)^2}{2!} f''(1) + \frac{(x-1)^3}{3!} f'''(1) + \dots \infty$$

$$f'(x) = \frac{1}{1+x^2}$$

$$f'(1) = \frac{1}{2}$$

$$f''(x) = \frac{-2x}{(1+x^2)^2}$$

$$f''(1) = \frac{-1}{2}$$

$$f'''(x) = \frac{6x^4 + 4x^2 - 2}{(1+x^2)^4}$$

$$f'''(1) = \frac{+1}{2}$$

$$\tan^{-1}x = \frac{x}{4} + \frac{1}{2}(x-1) - \frac{1}{4}(x-1)^2 + \frac{1}{12}(x-1)^3 + \dots \infty$$