

- 1.
- (a) Find the Taylor polynomial of order 5 at 0 for $f(x) = e^{-2x}$. (4 marks)
- (b) Use this Taylor polynomial to approximate $f(.5)$ to four decimal places. (3 marks)

Mark scheme:

(a) $f'(x) = -2e^{-2x}$

$$f''(x) = 4e^{-2x}$$

$$f'''(x) = -8e^{-2x}$$

$$f^{IV}(x) = 16e^{-2x}$$

$$f^V(x) = -32e^{-2x} \quad (M1)(A1)$$

At $a = 0$, the coefficients: $-2, 4, -8, 16, -32$ (A1)

$$e^{-2x} \approx 1 - 2x + \frac{4}{2!}x^2 - \frac{8}{3!}x^3 + \frac{16}{4!}x^4 - \frac{32}{5!}x^5 \quad (A1)$$

(b) $e^{-2(.5)} \approx 1 - 2(.5) + \frac{4}{2!}(.5)^2 - \frac{8}{3!}(.5)^3 + \frac{16}{4!}(.5)^4 - \frac{32}{5!}(.5)^5$ (M1)(A1)

$$\approx 0.3667 \quad (A1)$$