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Quiz 13

This quiz is graded out of 10 marks. No books, calculators, notes or cell phones are allowed. You must show all your work, the correct answer is worth 1 mark the remaining marks are given for the work. If you need more space for your answer use the back of the page.

Question 1. *(5 marks)* §8.8 #7 Find the 3rd degree Maclaurin polynomial of $f(x) = xe^{-2x}$.

$$P_3(x) = f(0) + f'(0)x + \frac{f''(0)x^2}{2!} + \frac{f'''(0)x^3}{3!}$$

$f(x) = xe^{-2x}$

$f(0) = 0e^0 = 0$

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

$f'(0) = e^0 + 0e^0(-2)$

$= 1$

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

$= -4e^{-2x} + 4xe^{-2x}$

$f''(0) = -4e^0 + 4(0)e^0 = -4$

$f'''(x) = 8e^{-2x} + 4e^{-2x} + 4xe^{-2x}(-2)$

$f'''(0) = 8e^0 + 4e^0 + 4(0)e^0(-2)$

$= 12$

$P_3(x) = x - \frac{4}{2!}x^2 + \frac{12x^3}{3!}$

$= x - 2x^2 + 2x^3$

Question 2. *(5 marks)* §8.8 #10 Find the 3rd degree Taylor polynomial of $f(x) = 1/x$ at $x = 1$.

$$P_3(x) = f(1) + f'(1)(x-1) + \frac{f''(1)(x-1)^2}{2!} + \frac{f'''(1)(x-1)^3}{3!}$$

$= 1 - (x-1) + \frac{2(x-1)^2}{2!} - \frac{6(x-1)^3}{3!}$

$= 1 - (x-1) + (x-1)^2 - (x-1)^3$

$f(x) = 1/x$

$f(1) = 1/1$

$f'(x) = -1/x^2$

$f'(1) = -1$

$f''(x) = \frac{2}{x^3}$

$f''(1) = \frac{2}{1^3} = 2$

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

$f'''(1) = -6$