NAME: _____

QUIZ 12

Dawson College
Course Code: 201-NYA-05 S07
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Question 1. *(5 marks)*

In an amplifier circuit, the current i (in A) changes with time t (in s) according to $i = 0.06t\sqrt{1+t^2}$. If 0.015 C of charge has passed a point in the circuit at $t = 0$, find the total charge to have passed the point at $t = 0.25s$.

$$q = \int i\,dt$$

$$= \int 0.06t\sqrt{1+t^2}\,dt \qquad u = 1+t^2,\ du = 2t\,dt$$

$$= \int 0.03\,u^{1/2}\,du$$

$$= 0.02u^{3/2} + C_1$$

$$q = 0.02(1+t^2)^{3/2} + C_1$$

At $t=0$ $q = 0.015$ so

$0.015 = 0.02 + C_1 \implies C_1 = -0.005$

At $t = 0.25$

$$q = 0.02(1+(0.25)^2)^{3/2} - 0.005$$

$$= \boxed{0.017\ \text{C}}$$

Question 2. *(5 marks)*

Use Simpson's rule with $n = 6$ intervals to approximate the value of $\int_1^4 x\sqrt{1+x^2}\,dx$

$\frac{b-a}{n} = \frac{4-1}{6} = 3/6 = 0.5$

$$\int_1^4 x\sqrt{1+x^2}\,dx \approx \frac{0.5}{3}\left(1\sqrt{1+1} + 4\left(1.5\sqrt{1+(1.5)^2}\right) + 2\left(2\sqrt{1+2^2}\right) + 4\left(2.5\sqrt{1+2.5^2}\right) + 2\left(3\sqrt{1+3^2}\right) + 4\left(3.5\sqrt{1+3.5^2}\right) + 4\sqrt{1+4^2}\right)$$

$$= \boxed{22.4213}$$

ACTUAL $\int_2^{17} \frac{1}{2}u^{1/2}\,du \qquad u = 1+x^2,\ du = 2x\,dx$

$= \frac{1}{3}u^{3/2}\Big|_2^{17} = 22.421456$