MA 16010 Quiz 10

Simplify your final answer. Show all relevant work for each problem. Little to no work, even with a correct answer, will receive little to no credit.

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1. If $\int_{-3}^{10} h(x)dx = 25$ and $\int_{2}^{10} h(x)\,dx = 29$, find $\int_{-3}^{2} h(x)dx$.

$$\int_{-3}^{10} h(x)dx = \int_{-3}^{2} h(x)dx + \int_{2}^{10} h(x)dx$$

$$25 = \int_{-3}^{2} h(x)dx + 29 \Rightarrow \boxed{-4 = \int_{-3}^{2} h(x)dx}$$

2. The velocity function, in meters per minute, of a particle moving along a straight line is $v(t) = 10t - 2$, where t is time in minutes. Find the displacement of the particle from $t = 3$ minutes to $t = 6$ minutes. $S(t)$ = position function

$$\text{Displacement} = S(6) - S(3)$$

$$= \int_{3}^{6} (10t-2)\,dt$$

$$= (5t^2 - 2t)\Big|_3^6$$

$$= (5(36) - 12) - (5(9) - 6)$$

$$= 168 - 39 = \boxed{129 \text{ meters}}$$

3. Use the Trapezoidal Rule to approximate $\int_0^9 x^2\,dx$ using $n = 3$ trapezoids.

$f(x) = x^2 \quad a = 0 \quad b = 9 \quad n = 3 \quad \Delta x = \frac{9-0}{3} = 3$

$x_0 = 0 \quad x_1 = 3 \quad x_2 = 6 \quad x_3 = 9$

$$T_3 = \left(\tfrac{1}{2}\right)(3)\left(f(0) + 2f(3) + 2f(6) + f(9)\right)$$

$$= \left(\tfrac{1}{2}\right)(3)\left(0 + 2(9) + 2(36) + 81\right)$$

$$= \left(\tfrac{1}{2}\right)(3)\left(0 + 18 + 72 + 81\right)$$

$$= \boxed{\frac{513}{2} = 256.5}$$