PS 3.4 AP Exam Prep

(58)

a) $T = \int_0^{24} R(t)\,dt$

$T = \frac{1}{2}\cdot 4\left(9.6 + 2(10.3) + 2(10.9) + \ldots + 9.6\right)$

$= 253.2$ gallons of water came out of the pipe in a 24 hr period.

b) Yes; $\frac{R(24) - R(0)}{24 - 0} = 0$. MVT says there is a point c in $[0, 24]$ s.t. $R'(c) = 0$

c) $\text{Ave}(Q) = \frac{1}{24}\int_0^{24} Q(t)\,dt$

$= 10.58$ gal/hr

(59) $f'(x) = ax^2 + bx$ $\quad f''(x) = 2ax + b = 6$

$-6 = a + b$ $\quad 2a + b = 6$

$b = 6 - 2a$

$-6 = a + 6 - 2a$

$a = 12$

$b = -18$

$f'(x) = 12x^2 - 18x$

$f(x) = 4x^3 - 9x^2 + C$

$\int_1^2 \left[4x^3 - 9x^2 + C\right] dx = 14$

$x^4 - 3x^3 + Cx \Big]_1^2 = 14$

$(16 - 24 + 2C) - (1 - 3 + C) = 14$

$C = 20$

$f(x) = 4x^3 - 9x^2 + 20$

(60) a) $\int_1^4 f(t)\,dt = 2$

$\int_1^{-2} f(t)\,dt = -\frac{9}{2}$ } area

b) $g'(2) = f(2) = 1$

c) min at $x = -2$

$g(-2) = -\frac{9}{2}$

d) at $x = 1$

$g''(x) = f'(x)$

since $f'(x)$ has a sign change at $x = 1$,

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