1) Your boat springs a leak at 2pm. Water is leaking in at a rate of $\frac{dW}{dt} = 1 + 3t$ gal/hr where t is the number of hours after 2pm. How much water enters your boat between 2pm and 4pm?

2) Approximate $\int_1^4 x^2 \, dx$ using 3 trapezoids.

$$\left(\text{Hint}: \quad T_n = \frac{1}{2}\Delta x \left[f(x_0) + 2f(x_1) + \ldots + 2f(x_{n-1}) + f(x_n) \right] \right)$$
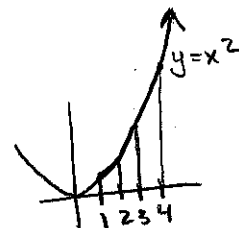
SOL

1) 2pm is $t=0$, 4pm is $t=2$

$$W(2) - W(0) = \int_0^2 1 + 3t \, dt = t + \frac{3}{2}t^2 \Big|_0^2$$

$$= 2 + \frac{3}{2}(4) - 0$$

$$= 2 + 6 = \boxed{8}$$

2) $a = 1$, $b = 4$, $\Delta x = \frac{4-1}{3} = 1$

$x_0 = 1$, $x_1 = 2$, $x_2 = 3$, $x_3 = 4$

$$T_3 = \frac{1}{2}(1)\left(f(1) + 2f(2) + 2f(3) + f(4) \right)$$

$$= \frac{1}{2}\left(1^2 + 2(2^2) + 2(3^2) + 4^2 \right)$$

$$= \frac{1}{2}(1 + 8 + 18 + 16) = \boxed{\frac{43}{2}}$$