5.6 HW

1. $\frac{dw}{dt} = 3000 + 20t$ "empty" $\rightarrow C = 0$

$w(t) = \int (3000 + 20t)\,dt = \boxed{3000t + 10t^2}$

$w(5) = 3000(5) + 10(5)^2 = \boxed{15250 \text{ liters}}$

3. $\frac{dv}{dt} = 2000t + 1000$, $C = 0$ ← No original supporters

$v(t) = \int (2000t + 1000)\,dt = 1000t^2 + 1000t$

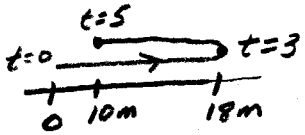
$v(60) = 1000(60)^2 + 1000(60) = \boxed{3,660,000}$

5. $s(t) = \int_2^5 (4t - 3)\,dt = 2t^2 - 3t \Big|_2^5 = (50 - 15) - (8 - 6) = \boxed{33 \text{ m}}$

7. $v(t) = -9.8t \rightarrow s(t) = \int_{.5}^{1} -9.8t\,dt = -4.9t^2 \Big|_{.5}^{1} = -4.9 + 1.225$
$= -3.675 \text{ m}$

Cat fell 3.675 m during the time period.

9. $v(t) = 12 - 4t$



displacement $= s(t) = \int_0^5 (12 - 4t)\,dt = 12t - 2t^2 \Big|_0^5 = 60 - 50 = \boxed{10 \text{ m}}$

Total distance $= \int_0^5 |12 - 4t|\,dt = \int_0^3 (12 - 4t)\,dt + \int_5^3 (12 - 4t)\,dt$

$= [12t - 2t^2]_0^3 + [12t - 2t^2]_5^3$

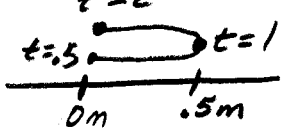
$= (18 - 0) + (18 - 10) = \boxed{26 \text{ m}}$

11. $v(t) = \frac{1}{t^2} - 1$, $[.5, 2]$

$\frac{1}{t^2} - 1 = 0 \rightarrow \frac{1}{t^2} = 1$

$1 = t^2$

$\pm 1 = t$



$s(t) = \int_{.5}^{2} \left(\frac{1}{t^2} - 1\right) dt = \left[\frac{-1}{t} - t\right]_{.5}^{2} = \frac{-5}{2} + \frac{5}{2} = 0$

11 cont. distance $= \int_{.5}^{2} \left|\frac{1}{t^2} - 1\right| dt = \int_{.5}^{1} \left(\frac{1}{t^2} - 1\right) dt - \int_{1}^{2} \left(\frac{1}{t^2} - 1\right) dt$

$= \left[\frac{-1}{t} - t\right]_{.5}^{1} - \left[\frac{-1}{t} - t\right]_{1}^{2} = \left(-2 + \frac{5}{2}\right) - \left(\frac{-3}{2} + 2\right)$

$= \frac{1}{2} + \frac{1}{2} =$ 1m

13. $v(t) = \int_{1}^{4} (8t - t^2) dt = 4t^2 - \frac{t^3}{3}\Big|_{1}^{4} = \left(64 - \frac{64}{3}\right) - \left(4 - \frac{1}{3}\right)$

$= 60 - 21 =$ 39 m/s

15. $\int_{0}^{2} (3000 + 2000t - 300t^2) dt = 3000t + 1000t^2 - 100t^3\Big|_{0}^{2}$

$= 6000 + 4000 - 800 =$ 9200 cars