The function v(t) is the velocity in m/sec of a particle moving along the x-axis. Determine when the particle is moving to the right, to the left, and stopped.

1) $v(t) = 13.6 - 0.2t,\ 0 \le t \le 120$ 1) ______________

$\boxed{13.6 - .2t} = 0$

$\frac{13.6}{.2} = \frac{.2t}{.2}$

$\frac{136}{2}$

$t = 68$

$\oplus$ $\oplus$ $\ominus$ $\ominus$

0 1 68 100 120

$13.6 - .2$ $13.6 - 20$

$\boxed{\begin{array}{l} \text{stopped @ } t = 68 \text{ sec} \\ \text{Rt } \quad 0 \le t < 68 \text{ sec} \\ \text{left } \ 68 < t \le 120 \text{ sec} \end{array}}$

Solve the problem.

2) The velocity in m/sec of a particle moving along the x-axis is given by the function 2) ____________
$v(t) = 6 \cos 3t$, $0 \le t \le \pi/2$
Find the particle's displacement for the given time interval.

$\rightarrow \int \text{vel}$

$$= \int_0^{\pi/2} 6\cos(3t)\,dt$$

$$\left.\frac{6\sin(3t)}{3}\right|_0^{\pi/2}$$

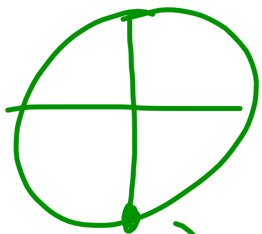
$$\left.2\sin(3t)\right|_0^{\pi/2}$$

$$\left(2\sin\frac{3\pi}{2}\right) - \left(2\sin 0\right)$$

$$2\cdot -1 \qquad 2\cdot 0$$

$$-2 - 0$$

$$-2$$



$(0,-1)$

The particle is 2 meters to the left of where it started.

The function v(t) is the velocity in m/sec of a particle moving along the x-axis. Find the total distance traveled by the particle.

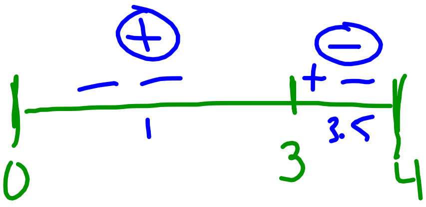
3) $v(t) = t^2 - 7t + 12,\ 0 \le t \le 4$

Rt/left 3) ________

$$t^2 - 7t + 12 = 0$$

$$(t-3)(t-4) = 0$$

$$t = 3, 4$$



$$\int_0^3 t^2 - 7t + 12\,dt + \left| \int_3^4 t^2 - 7t + 12\,dt \right|$$

$$\left. \frac{t^3}{3} - \frac{7t^2}{2} + 12t \right|_0^3 \qquad \left. \frac{t^3}{3} - \frac{7t^2}{2} + 12t \right|_3^4$$

$$\left(9 - \frac{63}{2} + 36\right) - (0) \qquad \left(\frac{64}{3} - 56 + 48\right) - \left(\frac{27}{2}\right)$$

$$45 - \frac{63}{2} \qquad \frac{64}{3} - 12$$

$$\frac{90}{2} - \frac{63}{2} \qquad \frac{64}{3} - \frac{36}{3}$$

$$\frac{27}{2} \qquad \frac{2 \cdot 28}{2 \cdot 3} - \frac{27 \cdot 3}{2 \cdot 3}$$

$$\frac{56}{6} - \frac{81}{6}$$

$$\left| -\frac{25}{6} \right|$$

$$\frac{3 \cdot 27}{3 \cdot 2} + \frac{25}{6}$$

$$\frac{81}{6} + \frac{25}{6} = \frac{106}{6} = \boxed{\frac{53}{3}\text{ m}}$$

Solve the problem.

4) A car moving with an initial velocity of 4 mph accelerates at the rate of a(t) = 2.3t mph per second for 8 seconds. How far did the car travel during those 8 seconds? 4) ______________

vel $= \int$ accel

$$\text{vel} = \int_0^{8\text{ sec}} 2.3t\,dt \ \frac{\text{mph}}{\text{sec}}$$

$$\left.\frac{2.3t^2}{2}\right|_0^8 \text{ mph} \quad + 4\text{mph}$$

$$\boxed{\left.1.15t^2\right|_0^8 + 4}$$

$$(1.15(64)) - (0)$$

$$73.6 + 4$$

$$\boxed{77.6\text{mph}} \quad \boxed{\text{fast}}$$

dist $= \int$ vel $\qquad$ vel $= 1.15t^2 + 4$ mph

$$\int_0^{8\text{ sec}} 1.15t^2 + 4\,dt \ \frac{\text{mi}}{\text{hr}}$$

$$\left.\frac{1.15t^3}{3} + 4t\right|_0^8$$

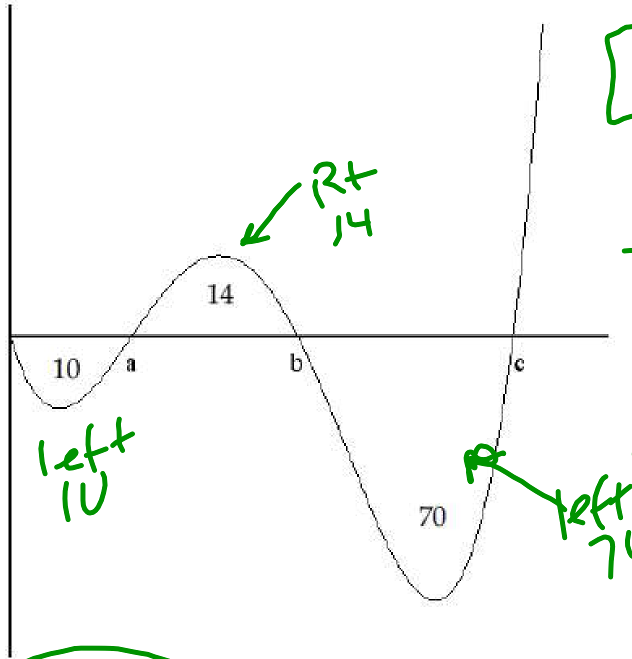
$$\frac{1.15(8)^3}{3} + 4(8) \ \text{sec}\cdot\frac{\text{mi}}{\text{hr}}$$

$$228.2\overline{6}\ \cancel{\text{sec}}\cdot\frac{\text{mi}}{\cancel{\text{hr}}}\cdot\frac{1\cancel{\text{hr}}}{60\cancel{\text{min}}}\cdot\frac{1\cancel{\text{min}}}{60\cancel{\text{sec}}}$$

$$\frac{228.2\overline{6}}{3600}\text{ mi}$$

$$\boxed{.063\text{ mi}}$$

5) A particle moves along the x–axis (units in cm). Its initial position at $t = 0$ sec is $x(0) = 18$. The figure shows the graph of the particle's velocity $v(t)$. The numbers are the areas of the enclosed regions.



$\boxed{\text{Total dist:}}$

$10+14+70$

94 cm

$\boxed{\text{Final Position}}$

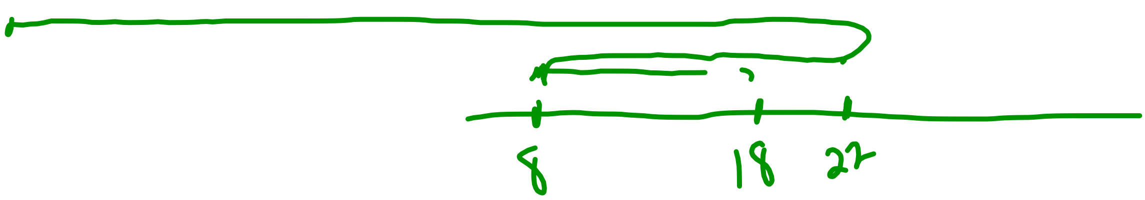
$18-66=\boxed{-48}$

$\boxed{\text{Displacement}}$

$-10+14-70$

$-80+14=\boxed{-66\text{cm}}$

What is the total distance traveled by the particle between $t = 0$ and $t = c$?



6) The rate at which your home consumes electricity is measured in kilowatts. If your home consumes electricity at the rate of 1 kilowatt for 1 hour, you will be charged for 1 "kilowatt-hour" of electricity. Suppose that the average consumption rate for a certain home is modeled by the function $C(t) = 4 - 2.4\sin(\pi t/12)$, where $C(t)$ is measured in kilowatts and t is the number of hours past midnight. Find the average daily consumption for this home, measured in kilowatt-hours.

24 hrs

$$\int_0^{24} 4 - 2.4\sin\left(\frac{\pi}{12}t\right)dt$$

$$4t + 2.4\cos\left(\frac{\pi}{12}t\right)\frac{12}{\pi}\Big|_0^{24}$$

$$\left(96 + 2.4\underbrace{\cos(2\pi)}_{1}\frac{12}{\pi}\right) - \left(0 + 2.4\underbrace{\cos(0)}_{1}\cdot\frac{12}{\pi}\right)$$

$$96 + \frac{28.8}{\pi} - \frac{28.8}{\pi}$$

$$\boxed{96\ \text{Kw}\cdot\text{h}}$$

7) The following table shows the rate of water flow (in gal/min) ~~from a stream~~ into a pond during a 30-minute period after a thunderstorm. Use the Trapezoidal Rule to estimate the total amount of water flowing into the pond during this period.

Time (min)	Rate (gal/min)
0	300
5	350
10	400
15	350
20	320
25	300
30	250

$T = \frac{h}{2}(y_1 + 2(\quad) + y_{last})$

$T = \frac{5}{2}(300 + 2(350) + 2(400) + 2(350) + 2(320) + 2(300) + 250)$

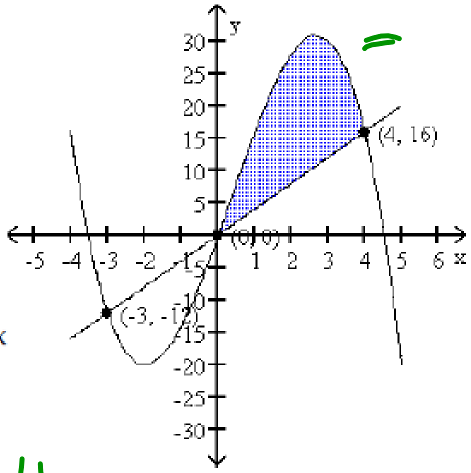
$\cancel{min} \cdot \frac{gal}{\cancel{min}}$

$T = \frac{5}{2}(3990)$

$\boxed{T = 9975 \text{ gal}}$

Find the area of the shaded region.

8) $f(x) = -x^3 + x^2 + 16x$



$g(x) = 4x$

$$\int_0^4 -x^3+x^2+16x-4x\,dx$$

$$\int_0^4 -x^3+x^2+12x\,dx$$

$$\frac{-x^4}{4}+\frac{x^3}{3}+6x^2\Big|_0^4$$

$$\left(\underbrace{-64+\frac{64}{3}+96}\right)-(0)$$

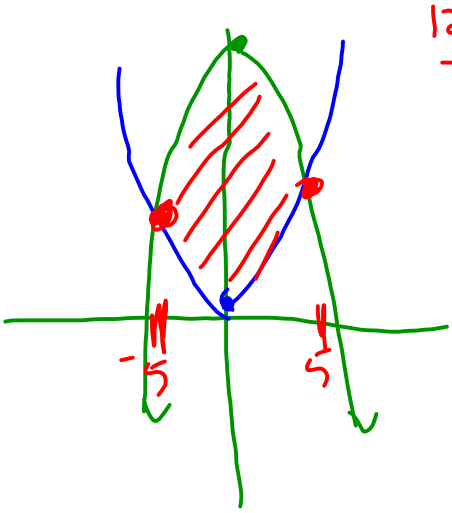
$$\frac{3\cdot 32}{3\cdot 1}+\frac{64}{3}$$

$$\frac{96+64}{3}$$

$$\boxed{\frac{160}{3}\ u^2}$$

Find the area of the regions enclosed by the lines and curves.

9) $y = 129 - 4x^2$ and $y = x^2 + 4$



$$129 - 4x^2 = x^2 + 4$$
$$-4 \quad +4x^2 \quad +4x^2 \quad -4$$

$$\frac{125}{5} = \frac{5x^2}{5}$$

$$25 = x^2$$

$$x = \pm 5$$

$$\int_{-5}^{5} \quad \text{or} \quad 2\int_{0}^{5}$$

$$2 \cdot \int_0^5 129 - 4x^2 - (x^2 + 4)\,dx$$

$$129 - 4x^2 - x^2 - 4$$

$$2\int_0^5 125 - 5x^2\,dx$$

$$125x - \frac{5x^3}{3}\Big|_0^5$$

$$2\left[\left(125(5) - \frac{5}{3}(125)\right) - (0)\right]$$

$$2\left[\frac{3}{3}\cdot\frac{625}{1} - \frac{625}{3}\right]$$

$$\frac{1875 - 625}{3}$$

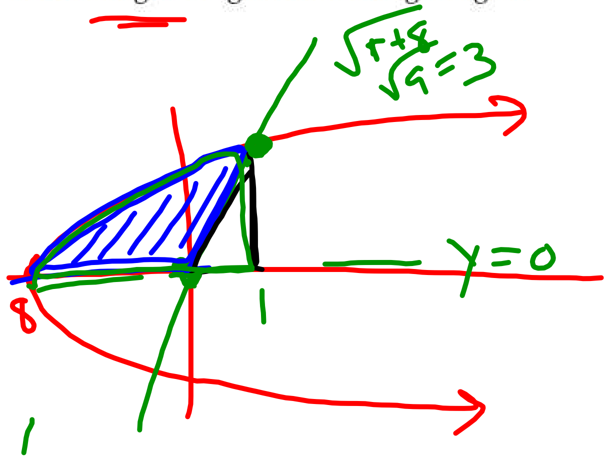
$$2\left(\frac{1250}{3}\right) = \boxed{\frac{2500}{3}\ u^2}$$

Find the area enclosed by the given curves.

10) Find the area of the region on or above the x-axis bounded by the curves $y^2 = x + 8$ and $y = 3x$. Find the area by subtracting the area of a triangular region from a larger region.

$\sqrt{y^2} = \sqrt{x+8}$

$y = \pm\sqrt{x+8}$



$\sqrt{x+8} = 3x$

$x+8 = 9x^2$

$0 = 9x^2 - x - 8$

$(9x+8)(x-1) = 0$

$x = -8/9 \quad x = 1$

$$\int_{-8}^{1} \sqrt{x+8}\,dx - \Delta$$

$\frac{1}{2} \cdot 1 \cdot 3$

$18 - 1.5$

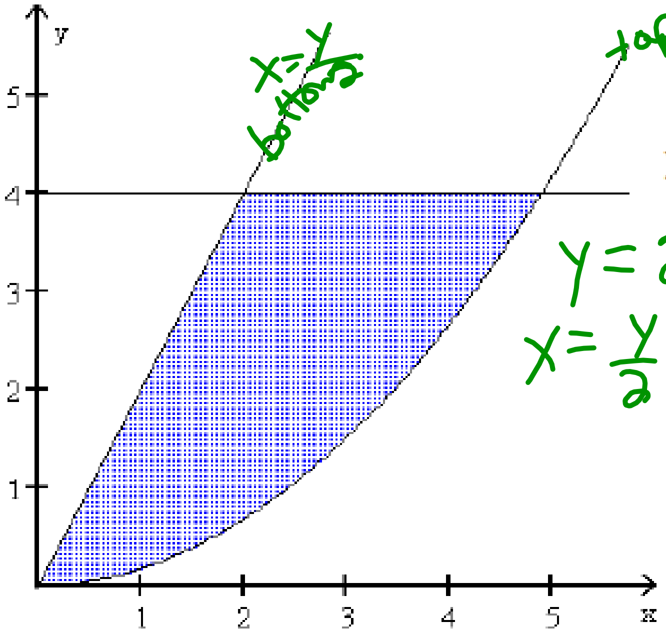
$\boxed{16.5u^2}$

Find the area of the shaded region.

11) $y = 2x$ $y = x^2/6$

top $x = \sqrt{6y}$

$x = \frac{y}{2}$ bottom



$y = 4$

$y = 2x$

$x = \frac{y}{2}$

$y = \frac{x^2}{6}$

$6y = x^2$

$x = \pm\sqrt{6y}$

$x = \sqrt{6y}$

$$\int_0^4 \sqrt{6y} - \frac{y}{2}\,dy = \boxed{9.064\ u^2}$$

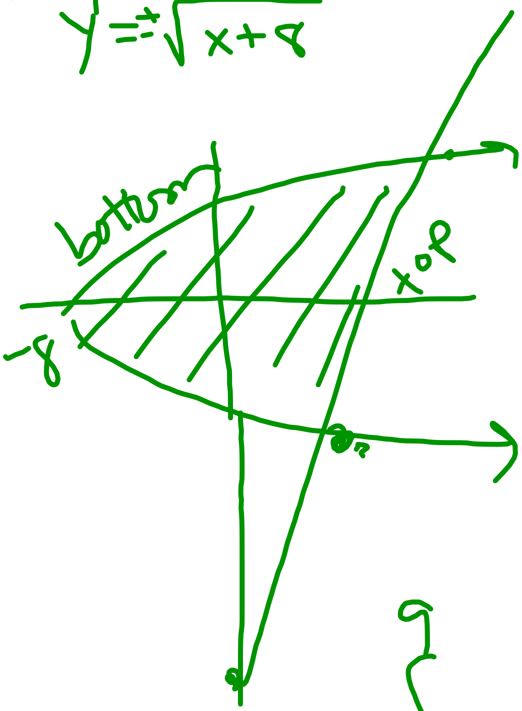
Find the area of the regions enclosed by the lines and curves.

12) $y^2 = x + 8$ and $x = y + 64$

$x = y^2 - 8$

$y = \pm\sqrt{x+8}$

$y = x - 64$



$y + 64 = y^2 - 8$

$y^2 - y - 72 = 0$

$(y-9)(y+8) = 0$

$y = 9, -8$

$$\int_{-8}^{9} y + 64 - (y^2 - 8)\, dy$$