

Warm-Up Problems and Lecture Problems

Solutions March 19, 2003

1. (a) Find the equation of the line connecting the points $(5, 10)$ and $(10, 0)$.

Solution: $y = -2x + 20$ or $x = -\frac{1}{2}y + 10$.

- (b) Consider the region between the y -axis and the line segment above. Rotate this region about the y -axis and draw the resulting solid.

- (c) Find the area of a cross section ($A(y)$).

Solution: $A(y) = \pi x^2 = \pi(-\frac{1}{2}y + 10)^2$.

- (d) Find the volume of the solid.

Solution:

$$V = \int_0^{10} A(y) dy = \int_0^{10} \pi(-\frac{1}{2}y + 10)^2 dy = \frac{8000\pi}{3} \approx 8378$$

2. If 1 kilogram weighs 2.2 pounds, how many kilograms is a person who weighs 180 pounds?

Solution:

$$180\text{lbs} \times \frac{1\text{kg}}{2.2\text{lbs}} = 81.8\text{kg}$$

3. Suppose your dog Fido has a mass of 10 kilograms.

- (a) If Fido steps on your bathroom scale (measuring pounds), what should your scale read?

Solution: Do a computation similar to the previous one:

$$10\text{kg} \times \frac{2.2\text{lbs}}{1\text{kg}} = 22\text{lbs}$$

- (b) Now you and Fido orbit in the space station with your bathroom scale. How much does Fido weigh in orbit? (What does your bathroom scale read now?)

Solution: Nothing! Imagine taking a scale into space and stepping on it. Nothing will register!

(I'm trying to illustrate the difference between *mass* and *weight*.)