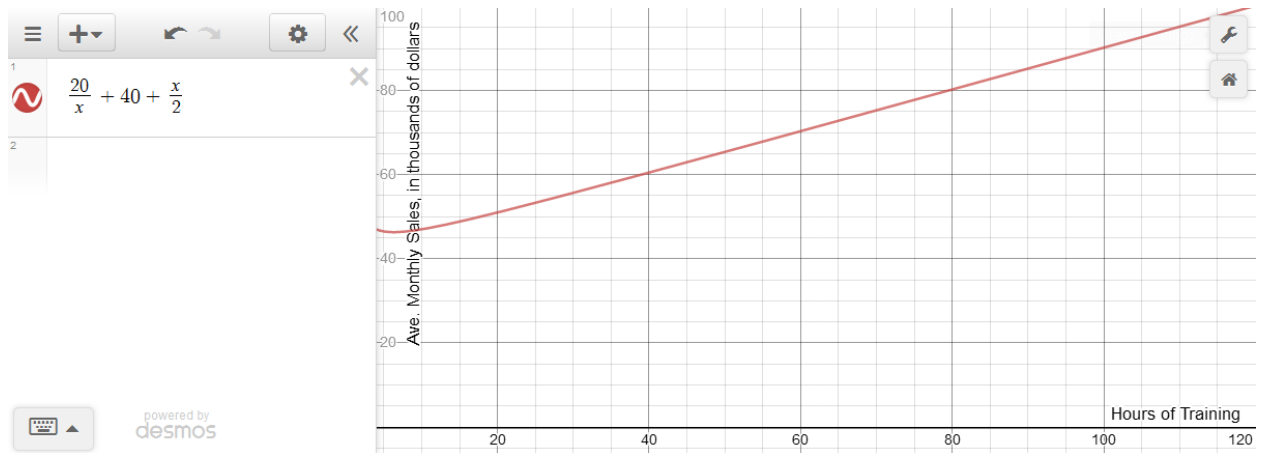


College Algebra, Section 6.5, #52  
Rational Functions and Rational Equations

**Sales and Training** The average monthly sales volume (in thousands of dollars) for a company depends on the number of hours of training  $x$  of its sales staff, according to<sup>1</sup>

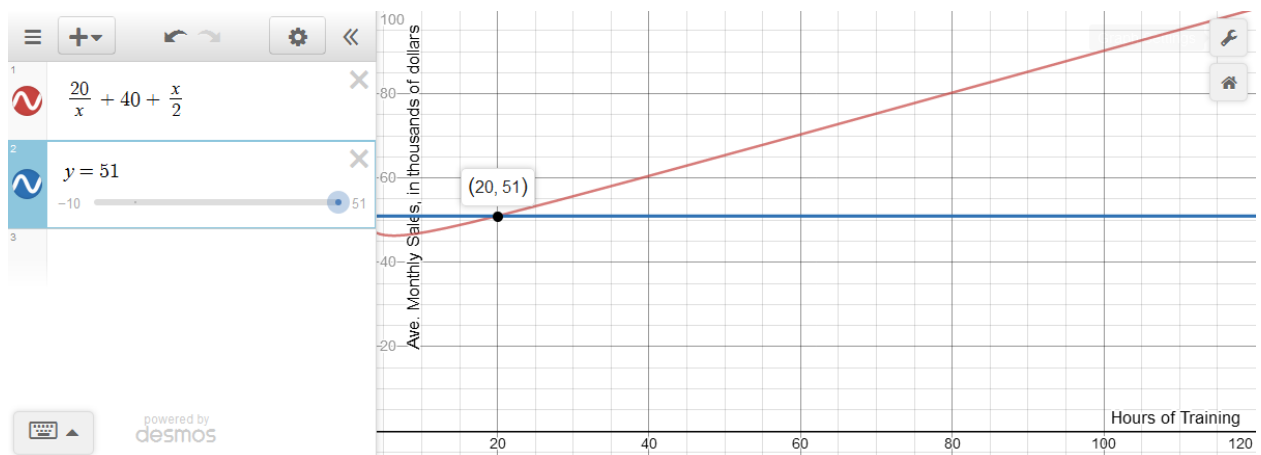
$$S(x) = \frac{20}{x} + 40 + \frac{x}{2} \quad \text{for} \quad 4 \leq x \leq 120$$

a. Graph this function.



b. How many hours of training will give average monthly sales of \$51,000?

Average monthly sales are given in thousands of dollars so \$51,000 is represented by the line  $y = 51$ . The intersection of these two graphs gives us the number of hours of training needed to achieve an average of \$51,000 in monthly sales.



The point  $(20, 51)$  tells us that 20 hours of training will give average monthly sales of \$51,000.

<sup>1</sup>Harshbarger/Yocco, *College Algebra In Context*, 5e, p. 491, #52.

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We can also solve this problem algebraically by letting  $S(x) = 51$  and solving for  $x$ .

$$S(x) = \frac{20}{x} + 40 + \frac{x}{2}$$

$$51 = \frac{20}{x} + 40 + \frac{x}{2}$$

$$51(2x) = \frac{20}{x}(2x) + 40(2x) + \frac{x}{2}(2x)$$

$$51(2x) = \frac{20}{\cancel{x}}(2\cancel{x}) + 40(2x) + \frac{x}{\cancel{2}}(\cancel{2}x)$$

$$102x = 40 + 80x + x^2$$

$$0 = x^2 - 22x + 40$$

$$0 = (x - 2)(x - 20)$$

$$x = 2 \quad \text{or} \quad x = 20$$

But remember, the function is only defined in the interval  $4 \leq x \leq 120$  so we must omit the value  $x = 2$  as a solution.

And again, 20 hours of training will give average monthly sales of \$51,000.