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Exercise 1, 3, 73 Find an equation of the line perpendicular to the line $y = \frac{1}{2}x + 4$ which contains the point $(1, -2)$.

Solution

Notice that the line $y = \frac{1}{2}x + 4$ is in the slope intercept form $y = mx + b$ where $m = 1/2$ and $b = 4$. By the Criterion for Perpendicular Lines (Theorem 1, 3, F), a line perpendicular to the given line has slope $\frac{-1}{(1/2)} = -2$.

So the desired line has slope $m = -2$ and contains the point $(x_1, y_1) = (1, -2)$.

By the point slope formula $y - y_1 = m(x - x_1)$ we have $y - (-2) = (-2)(x - (1))$ or $y + 2 = -2(x - 1)$ or $y = -2(x - 1) - 2$ or $y = -2x + 2 - 2 = -2x$.

The desired line is

$$\boxed{y = -2x}$$

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