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1. Find the average rate of change of $y = \sqrt{2x-1}$ between $x = 1$ and $x = 5$.

Solution. The average rate of change of $y = f(x)$ between $x = a$ and $x = b$ is

$$\frac{f(b) - f(a)}{b - a}$$

and so we have

$$\frac{\sqrt{2 \cdot 5 - 1} - \sqrt{2 \cdot 1 - 1}}{5 - 1} = \frac{\sqrt{9} - \sqrt{1}}{4} = \frac{2}{4} = \frac{1}{2}.$$

So the average rate of change is $1/2$.

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2. Sketch the graph of $y = \frac{1-2x}{5x-20}$ including x and y intercepts and horizontal and vertical asymptotes.

Solution. First, we observe that $5x - 20 = 0$ exactly when $x = 4$, and when $x = 4$, the numerator, $1 - 2x$, is $-7 \neq 0$, so there is a vertical asymptote at $x = 4$.

Next,

$$\lim_{x \rightarrow \infty} \frac{1-2x}{5x-20} = \lim_{x \rightarrow \infty} \frac{1/x-2}{5-20/x} = \frac{-2}{5}$$

so there is one horizontal asymptote, at $y = -2/5$.

To find the y -intercept, we let $x = 0$, to get $y = 1/-20$ and to find the x -intercept, we set $y = 0$, that is, solve

$$0 = \frac{1-2x}{5x-20}, \quad 0 = 1-2x, \quad 2x = 1,$$

which gives $x = 1/2$.

