

Problem 8: Let $R(x) = \frac{2x+1}{1-x}$.

(a) List all the asymptotes of $R(x)$.

• HORIZONTAL ASYMPTOTE: $x \sim \infty, R(x) \sim \frac{2x}{-x} = -2$
So $\boxed{y = -2}$

• VERTICAL ASYMPTOTE: $x \sim 1, R(x) \sim \infty$
So $\boxed{x = 1}$

(b) Show how to obtain R as the shift of a known graph

Let $u = 1-x$, then $x = 1-u$. So

$$\frac{2x+1}{1-x} = \frac{2(1-u)+1}{u} = \frac{2-2u+1}{u} = \frac{3-2u}{u} = \frac{3}{u} - 2$$

$$\therefore R(x) = \frac{3}{1-x} - 2 = -\frac{3}{x-1} - 2 = -3f(x-1) - 2$$

WHERE $f(x) = \frac{1}{x}$ (KNOWN GRAPH)

(c) Sketch the graph $y = R(x)$.

