

(1) Solve for x in the equation $\frac{2}{x+1} - \frac{1}{x^2} = 0$

$$(x+1)x^2 \left(\frac{2}{x+1} - \frac{1}{x^2} \right) = 0(x+1)x^2$$

$$\frac{2(x+1)x^2}{x+1} - \frac{(x+1)x^2}{x^2} = 0$$

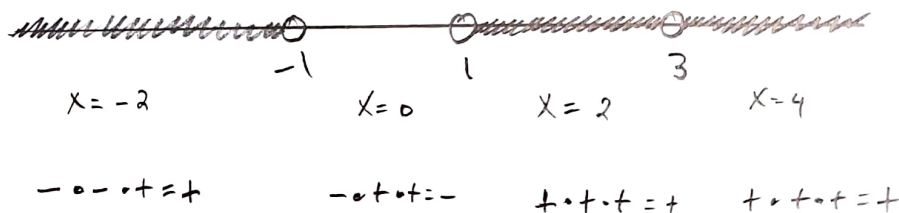
$$2x^2 - x - 1 = 0$$

$$(2x+1)(x-1) = 0$$

$$2x+1=0 \quad x-1=0$$

$$x = -\frac{1}{2} \quad x = 1$$

(2) Solve the inequality $(x-1)(x+1)(x-3)^2 > 0$



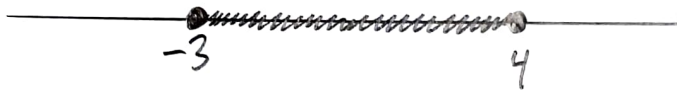
$$(-\infty, -1) \cup (1, 3) \cup (3, +\infty)$$

(3) Solve the inequality $|2x - 1| \leq 7$.

$$\begin{array}{ccccccc} -7 & \leq & 2x - 1 & \leq & 7 & & \\ +1 & & +1 & & +1 & & \end{array}$$

$$\frac{-6}{2} \leq \frac{2x}{2} \leq \frac{8}{2}$$

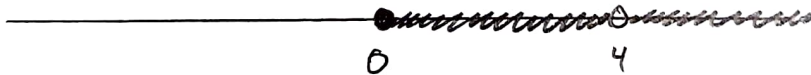
$$-3 \leq x \leq 4$$



$$[-3, 4]$$

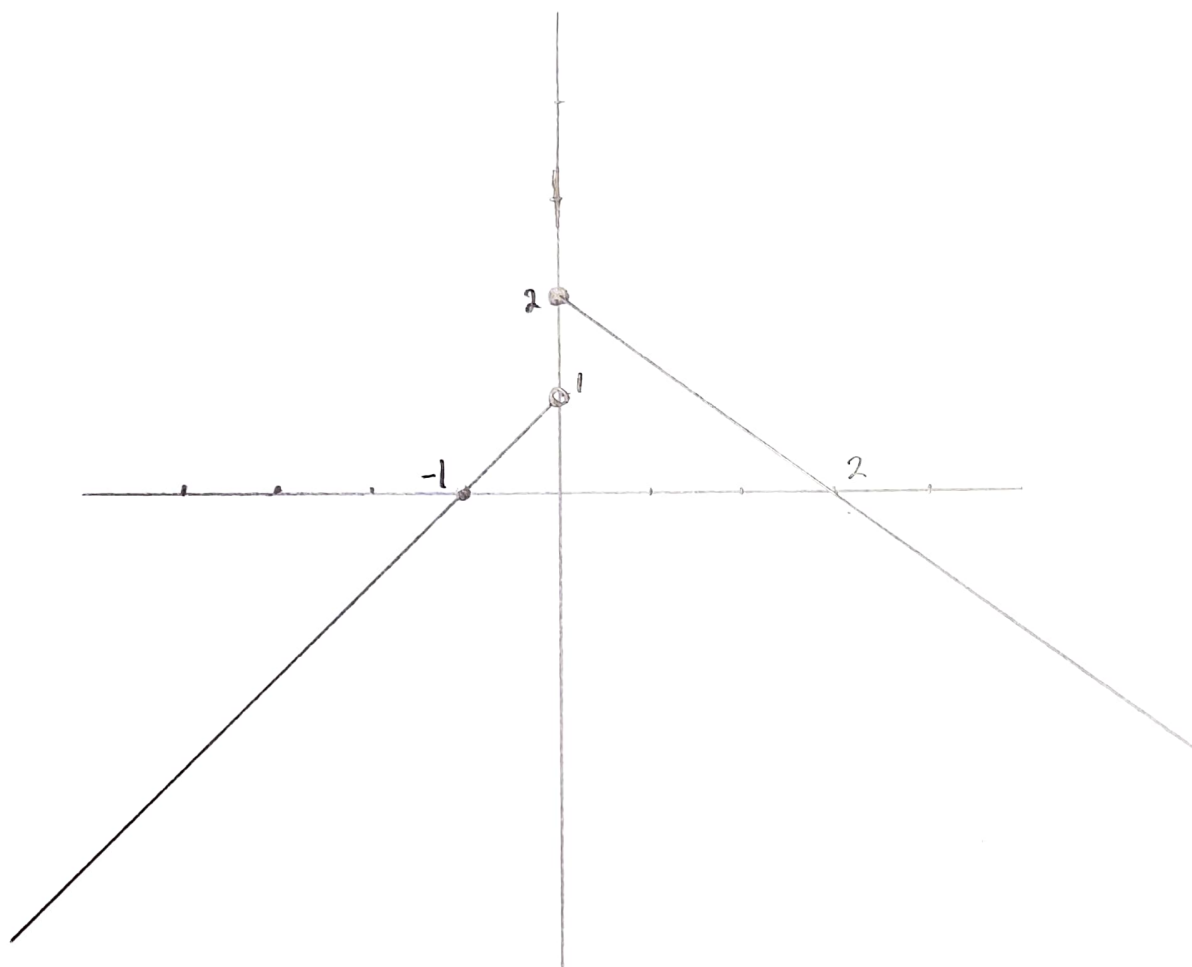
(4) Find the domain of the function $f(x) = \frac{\sqrt{x}}{x-4}$

$$x \geq 0 \text{ and } x \neq 4$$



$$[0, 4) \cup (4, +\infty)$$

(5) Sketch the graph of the piecewise-defined function $f(x) = \begin{cases} x + 1 & \text{if } x < 0 \\ 2 - x & \text{if } x \geq 0 \end{cases}$



(6) Find the net change and the average rate of change of the function $f(x) = x^3 - x$ over the interval $1 \leq x \leq 3$.

$$\text{Net change} = f(3) - f(1) = (3^3 - 3) - (1^3 - 1) = (27 - 3) - 0 = 24$$

$$\text{Avg Rate of change} = \frac{f(3) - f(1)}{3 - 1} = \frac{24}{2} = 12$$

(7) An elevator travels upwards at a constant speed of 5 feet/second. The elevator starts 10 feet up the elevator shaft of 120 feet. Find a function which measures the height of the elevator at t second. How long does it take for the elevator to reach the top of the shaft?

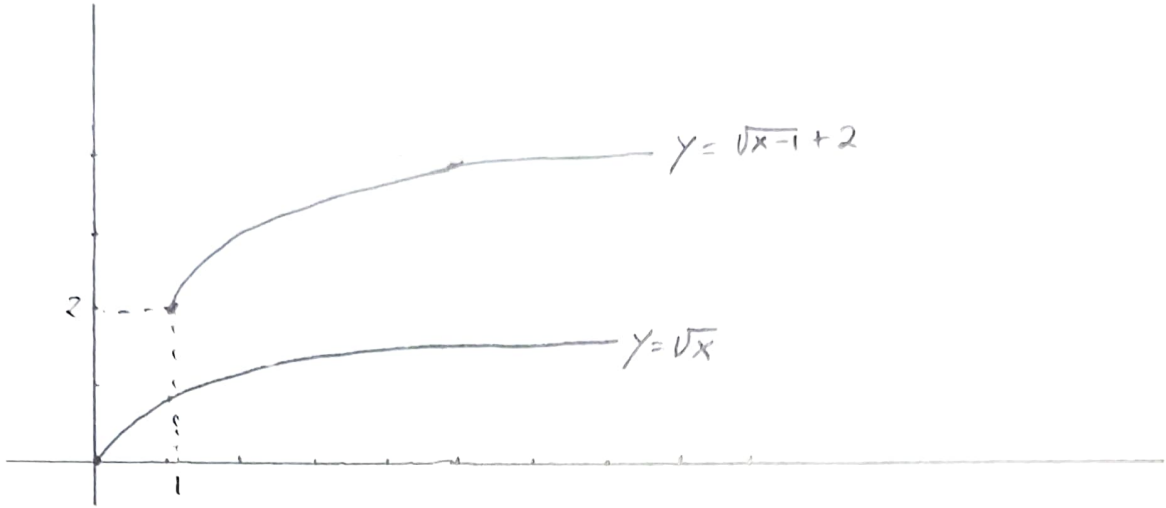
$$h(t) = 5t + 10 \text{ feet}$$

$$120 = 5t + 10$$

$$110 = 5t$$

$$22 \text{ seconds} = t$$

(8) On the same set of x - and y -axes sketch the graph of $y = \sqrt{x}$ and $y = \sqrt{x-1} + 2$.



(9) Given $f(x) = 3x + 2$ find its inverse function.

$$y = 3x + 2$$

$$x = 3y + 2$$

$$x - 2 = 3y$$

$$\frac{x-2}{3} = y$$

$$\boxed{f^{-1}(x) = \frac{x-2}{3}}$$

(10) Given $f(x) = 3x+1$ and $g(x) = \frac{1}{x+1}$ find $f \circ g$, $g \circ f$, $f \circ f$, and $g \circ g$. Simplify your final expression for each.

$$(f \circ g)(x) = f(g(x)) = f\left(\frac{1}{x+1}\right) = 3\frac{1}{x+1} + 1 = \frac{3}{x+1} + \frac{x+1}{x+1}$$
$$= \frac{x+4}{x+1}$$

$$(g \circ f)(x) = g(f(x)) = g(3x+1) = \frac{1}{3x+1+1} = \frac{1}{3x+2}$$

$$(f \circ f)(x) = f(f(x)) = f\left(\frac{1}{x+1}\right) = \frac{1}{\frac{1}{x+1} + 1} = \frac{1}{\frac{1}{x+1} + \frac{x+1}{x+1}} \checkmark$$
$$= \frac{1}{\frac{x+2}{x+1}} = \frac{x+1}{x+2}$$

$$(g \circ g)(x) = g(g(x)) = g(3x+1) = 3(3x+1) + 1 = 9x+3+1$$
$$= 9x+4$$