1. Circle the number of the transformation in function notation (see below) that matches the description of the transformations (a) - (e).

   a) \( f(x) \) translated right 3
   b) \( f(x) \) translated up 3
   c) \( f(x) \) translated down 3 and right 2
   d) \( f(x) \) translated down 3 and left 2
   e) \( f(x) \) reflected in the y-axis
   f) \( f(x) \) reflected in the x-axis

   1. \( y = f(-x) \)  2. \( y = -f(x) \)  3. \( y = f(x - 3) \)  4. \( y = f(x + 3) \)
   5. \( y = f(x) + 3 \)  6. \( y = f(x - 2) - 3 \)  7. \( y = f(x + 2) - 3 \)  8. \( y = f(x - 3) - 2 \)

2. State whether each relation below represents a function. Explain your reasoning.
   Also, determine the domain and range for each relation.

   a) \( \{(1, 2), (2, 3), (2, -1), (4, -1)\} \)
      - Is a function
      - Is not a function
      Reasoning: Two points have the same x-value with different y-values.

      \[ D = 2 \times 2 = 4 \]
      \[ R = \{2, 3, -1\} \]

   b) \( y = x \)
      - Is a function
      Reasoning: A line with slope 1 is a function.

      \[ D = \{x \in \mathbb{R}\} \]
      \[ R = \{y \in \mathbb{R}\} \]

   c) \( x = -5 \)
      - Is not a function
      - Is not a function
      Reasoning: A vertical line is not a function.

      \[ D = \{x \in \mathbb{R}\} \]
      \[ R = \{y \in \mathbb{R}\} \]

   d) \( x^2 + y^2 = 49 \)
      - Is a function
      - Is not a function
      Reasoning: There are points where the same y-value has more than 1 x-value.

      \[ D = \{x \in \mathbb{R}| -7 \leq x \leq 7\} \]
      \[ R = \{y \in \mathbb{R}| -7 \leq y \leq 7\} \]

   e) \( y = (x + 3)^2 + 4 \)
      - Is a function
      - Is not a function
      Reasoning: A quadratic is a function.

      \[ D = \{x \in \mathbb{R}\} \]
      \[ R = \{y \in \mathbb{R}| y \geq 4\} \]

   f) \( f(x) = \sqrt{x + 1} - x + 1 \)
      - Is a function
      - Is not a function
      Reasoning: A root function is a function.

      \[ D = \{x \in \mathbb{R}| x \geq -1\} \]
      \[ R = \{y \in \mathbb{R}| y \geq 0\} \]

3. Given \( f(x) = 5 - 4x \), find

   a) \( f(2) \)
      \[ f(2) = 5 - 4(2) \]
      \[ = 5 - 8 \]
      \[ = -3 \]

   b) \( f(-3) \)
      \[ = -((5 - 4(-3)) \]
      \[ = -((5 - 12) \]
      \[ = -(-7) \]
      \[ = 7 \]

   c) \( x \) when \( f(x) = 10 \)
      \[ 5 - 4x = 10 \]
      \[ -4x = 5 \]
      \[ x = -\frac{5}{4} \]
4. Let \( f(x) = \sqrt{x+1} \) if \( x \geq -1 \)

a) Determine the new image equation if \( y = f(x+2) - 4 \).
\[
\begin{align*}
y &= \sqrt{(x+1)+2} - 4 \\
y &= \sqrt{x+3} - 4
\end{align*}
\]

b) Sketch a graph of \( f(x) = \sqrt{x+1} \) and \( y = f(x+2) - 4 \) on the same grid.
Label each curve.

\[ y = \sqrt{x+1} \]
\[ y = f(x) \]
\[ y = f(x+2) - 4 \]

\[ y = \sqrt{x+3} - 4 \]

\[ \text{Original Image} \]
\[ D: \{ x \in \mathbb{R} \mid x \geq -1 \} \]
\[ R: \{ y \in \mathbb{R} \mid y \geq 0 \} \]

\[ \text{Transformed Image} \]
\[ D: \{ x \in \mathbb{R} \mid x \geq -3 \} \]
\[ R: \{ y \in \mathbb{R} \mid y \geq -4 \} \]

d) If the original image, \( f(x) = \sqrt{x+1} \) was transformed to \( y = f(-x) \) state its new domain and range.
\[ D: \{ x \in \mathbb{R} \mid x \leq 1 \} \]
\[ R: \{ y \in \mathbb{R} \mid y \geq 0 \} \]

5. If \( f(x) = \frac{1}{x-2} + 5 \), state the domain, range and the equations of the asymptotes.

**Vertical Asymptote:** \( x = 2 \)

**Horizontal Asymptote:** \( y = 5 \)

\[ D: \{ x \in \mathbb{R} \mid x \neq 2 \} \]
\[ R: \{ y \in \mathbb{R} \mid y \neq 5 \} \]

Note: This is \( y = \frac{1}{x} \) shifted right 2, up 5