1. (2 points) **Multiple Choice. Circle the best answer. No partial credit available**

Find a value of $c$ so that $f(x) = \begin{cases} x^2 - 6 & \text{if } x \leq c \\ 2x - 7 & \text{if } x > c \end{cases}$ is continuous everywhere.

- A. $c = 0$
- B. $c = 1$
- C. $c = 2$
- D. $c = 3$
- E. None of the above.

2. (2 points) **Fill-in-the-Blank. No partial credit available**

Consider the graph of $f(x)$ to the right. Classify each discontinuity from the types:

- Removable Discontinuity
- Jump Discontinuity
- Infinite Discontinuity

(a) $x = 1$ is a **Removable** Discontinuity.

(b) $x = 2$ is a **Infinite** Discontinuity.

(c) $x = 3$ is a **Jump** Discontinuity.

(d) $x = 4$ is a **Jump** Discontinuity.
3. (2 points) Show that \( f(x) = \begin{cases} x^2 \sin \left( \frac{1}{x} \right) & \text{if } x \neq 0 \\ 0 & \text{if } x = 0 \end{cases} \) is continuous at \( x = 0 \).

**Solution:** Since \( \sin \left( \frac{1}{x} \right) \) is always between \(-1\) and \(1\), we know that

\[-x^2 \leq x^2 \sin \left( \frac{1}{x} \right) \leq x^2\]

Since \( \lim_{x \to 0} x^2 = \lim_{x \to 0} (-x^2) = 0 \), then by the **Squeeze Theorem**, we also have that \( \lim_{x \to 0} x^2 \sin \left( \frac{1}{x} \right) = 0 \). Since \( f(0) = 0 \) is the same as this limit, the function is continuous at \( x = 0 \).