Name: ______________________________ **Section**: ______________

Clear your desk of everything excepts pens, pencils and erasers. **Show all your work.**
If you have a question raise your hand and I will come to you.

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. $c = 1$

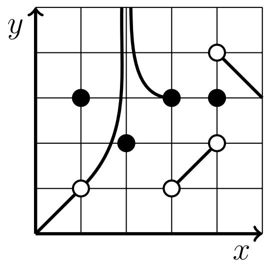
   C. $c = 2$

   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.

Continue on to back side

3. (2 points) Show that $f(x) = \begin{cases} x^2 \sin\left(\dfrac{1}{x}\right) & \text{if } x \neq 0 \\ 0 & \text{if } x = 0 \end{cases}$ 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 $x = 0$.