Instructions: Books, notes, and electronic devices are not permitted. This exam is worth 100 points. Box your final answers. Write neatly. A correct answer with incorrect or no supporting work may receive no credit. **SHOW ALL WORK.**

Name:____________________________________________

Instructor/Section #:_______________________________________

1. (24 points) Solve the following equations or inequalities. All work must be shown. Box your final answer.
   a. \( \sqrt{3x + 6} = 2x + 1 \)

   \[ \frac{x}{x+3} = \frac{8}{x+6} \]

   c. Solve the following equation for C. \( \frac{A+1}{B+1} = \frac{C+4}{A+4} \)

   d. Solve the inequality and give the solution in interval notation. \( \frac{-4}{x^2-8x-9} \geq 0 \)
2. (24 points) Short Answer Questions

a. Which of the following is the domain of the function: $f(x) = \frac{x}{\sqrt[3]{x-2}}$

(i) $[0, \infty)$ (ii) $(2, \infty)$ (iii) $[2, \infty)$ (iv) $(-\infty, 2) \cup (2, \infty)$

b. Which of the following is the domain of the function: $f(x) = \frac{x-3}{x^2-9}$

(i) $(-\infty, 3) \cup (3, \infty)$ (ii) $(-\infty, -3) \cup (-3, 3) \cup (3, \infty)$

(iii) $(-3, 3)$ (iv) $(-\infty, -3) \cup (3, \infty)$

c. Write the following as a piecewise function: $f(x) = 3 + |2x - 5|$

d. Write an equation for a function that has a graph with the given characteristics: The shape of $y = \sqrt{x}$, but reflected across the y-axis and shifted left 2 units and down 1 unit.

e. Find and simplify the difference quotient, $\frac{f(x+h)-f(x)}{h}$, for the function $f(x) = \frac{1}{x+2}$. 
3. (12 points) True and False. Circle whether each statement is True or False.

a. True / False   The inequality \( x^2 < 16 \) is equivalent to the inequality \( x < 4 \).

b. True / False   \( \left( \frac{a}{b} \right)^{-1} = \frac{b}{a} \)

c. True / False   \( (a^2 + b^2)^{-1} = \frac{1}{a^2} + \frac{1}{b^2} \)

d. True / False   The average rate of change for any linear function is equal to the slope of the line.

4. (10 points) The growth rate \( G(x) \) in pounds per month of an infant is related to the present weight \( x \) in pounds by the function \( G(x) = cx(21 - x) \) where \( c \) is a positive constant and \( 0 < x < 21 \). Show all work and box your final answers.

a. At what weight does the maximum growth rate occur?

b. What is the maximum growth rate?

5. (12 points) Factor the following.

a. \( 25y^{2m} - (x^{2n} - 2x^n + 1) \)

b. \( 4x^2 - 4xy - y^2 \)
5. (18 points) Transformations. Match the function with its graph. Write your answer in the provided space.

\[
\begin{align*}
(i) & \quad g(x) = -2|x| & \quad \text{______________} \\
(ii) & \quad g(x) = |x - 1| + 1 & \quad \text{______________} \\
(iii) & \quad g(x) = -\frac{1}{3}x & \quad \text{______________} \\
(iv) & \quad g(x) = 2x & \quad \text{______________} \\
(v) & \quad g(x) = |x + 2| & \quad \text{______________} \\
(vi) & \quad g(x) = |x| + 3 & \quad \\
(vii) & \quad g(x) = -\frac{1}{2}|x - 4| & \quad \\
(viii) & \quad g(x) = \frac{1}{2}|x| - 3 & \quad \\
(ix) & \quad g(x) = -|x| - 2 & \quad \\
\end{align*}
\]