INSTRUCTIONS: Simplify and box all your answers. Write neatly and show all work. A correct answer with incorrect or no supporting work may receive no credit. Books, notes, and electronic devices are not permitted. The exam is worth 100 points.

Name:____________________________________________________________

1. The following are unrelated. (36 pts)

   (a) Multiply to express as a polynomial: \((2x - 3y)^2\).

   (b) Evaluate the expression \(-\frac{1}{2}x^2 + x^{-1}\) when \(x = -\frac{1}{2}\).

   (c) Simplify: \(a^{5/6} (a^{-1/6}b^{2/3})^2\)

   (d) Multiply to express as a polynomial: \((\sqrt{x - 1} + 2)(\sqrt{x - 1} - 2)\)
(e) Factor: \(x^4 + 2x^2 - 8\) over the real numbers.

(f) Factor \(2x^3 + 16\) over the real numbers.

(g) Combine into a single fraction: \(\frac{4}{x - 2} + \frac{1}{x + 3}\)

(h) Simplify (give your answer without negative exponents): \(\frac{4x^{-2}y^3z^{-1}}{14x^3y^4}\)

(i) Simplify the expression: \(\frac{1}{x-2} \cdot \frac{2}{x+1}\)
2. Find all real valued solutions of the following equations: (20 pts)

(a) \( \frac{24}{3-x} = 4 \)

(b) \( 5x^3 + 10x^2 - 20x - 40 = 0 \)

(c) \( q^2 = 3q \)

(d) \( x + \sqrt{x+2} = 4 \)
3. Solve the following for $M$: (10 pts)
   
   (a) $RM = 3M + T$

   (b) $\frac{3}{NM} + \frac{1}{M} = 2$

4. The following are unrelated. (10 pts)
   
   (a) Simplify: $(2 - 3i) - (5 - i)$

   (b) Simplify: $(5 + 2i)^2$

   (c) Find all real and complex solutions: $x^2 + 4x + 5 = 0$
5. Solve the following inequalities. Give all answers in interval notation: (12 pts)

(a) \( x^2(x - 2) < 0 \)

(b) \( |x - 2| \leq 4 \)

(c) \( x^3 + x^2 - 2x \geq 0 \)
6. For the following points $A(-1, -2)$ and $B(3, 4)$: (12 pts)

(a) Graph and clearly label the two points.

(b) Find the distance between $A$ and $B$.

(c) Find the midpoint between $A$ and $B$.

(d) Find the point on segment $AB$ that is three-fourths of the way from $A$ to $B$.

Potentially useful formulas:

(i) $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$

(ii) $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$