INSTRUCTIONS: **Simplify** and **box** all your answers. Write neatly and **justify all answers**. A correct answer with incorrect work or no justification may receive no credit. Books, notes, electronic devices, other unauthorized devices, and help from another person are not permitted while taking the exam. The exam is worth 100 points.

Potentially useful formulas:

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

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

NOTE: YOU MAY TEAR OFF THIS FIRST PAGE AND USE (FRONT AND BACK) AS SCRATCH PAPER.

i. DO NOT START UNTIL INSTRUCTED BY A PROCTOR.

ii. THE EXAM IS ON BOTH SIDES OF EACH FOLLOWING EXAM PAGE

iii. WRITE YOUR NAME ON THE NEXT PAGE.

iv. WHEN YOU FINISH (IF BEFORE THE EXAM END TIME) PLEASE QUIETLY COLLECT YOUR THINGS AND FOLLOW PROCTOR INSTRUCTIONS IN UPLOADING YOUR EXAM WITH SUPPORTING WORK TO GRADESCOPE. ONLY WORK THAT'S SUBMITTED TO GRADESCOPE WILL BE GRADED.

Name: _____

1. The following are unrelated: (8 pts)

   (a)

3. Simplify (4 pts): $\dfrac{j5j}{1\ \ j}\ \ \dfrac{j3 + 4j}{3 + 1j}$

4. The following are unrelated: (16 pts)

(a) Evaluate: $P_{15}P_6$

(b) Simplify and combine: $\sqrt{50x^4y}\quad \sqrt{18x^4y}$

(c) Simplify the expression: $\sqrt{9x^2 + 9}$

(d) Evaluate: $12(\,x)^3$ for $x = \dfrac{1}{2}$

5. The following are unrelated: (12 pts)

(a) Simplify (Give your answer without negative exponents): $\dfrac{a^{10}b^{-2}a^{-1}}{b^{11}}$ $2a^{1-9}a^{1-3}\,^{3}$

(b) Multiply and simplify: $p\sqrt{x}\,^{-2}\,^{3}\,^{2}$

(c) Multiply: $\dfrac{1}{4}p\sqrt{x}\;\;2x^{3-2}+12p\sqrt{x}$

6. The following are unrelated: (12 pts)

(a) Simplify: $\dfrac{2x(3x)^2x - 3x(x + 2)(-2)}{2x}$

(b) Perform the multiplication and simplify: $\dfrac{z^3 - 8}{2z^2 + 12z + 18} \cdot \dfrac{z^2 + 3z}{3z - 6}$

(c) Simplify the compound fraction: $\dfrac{\dfrac{3}{x-1} - \dfrac{1}{x}}{x-1}$

7. Determine whether or not $x = 4$ is a solution of the following equation (show all work to receive credit):

$$\frac{1}{x} - \frac{1}{x-6} = \frac{5}{4}$$ (3 pts)

8. Solve the following equation over the complex numbers: $3z^2 + 9 = 0$. (4 pts)

9. An explosion causes a rock to be flung upward at an initial velocity of 64 ft/s at time $t = 0$. An engineer wants to estimate at what times, t, the rock will reach a height of 48 ft. The engineer decides that solving the equation $-16t^2 + 64t = 48$ will give the answer. Use the equation to solve for t. (4 pts)

10. Solve the equation (4 pts): $\frac{2}{3}x - 2 = 1 - \frac{1}{2}x$

EXAM CONTINUES ON BACK

11. Solve each of the following equations: (8 pts)

(a) Solve for p: $T = \dfrac{2wp - 4p}{r}$

(b) $\dfrac{2y + 6}{y^3} + \dfrac{1}{y^2} = \dfrac{1}{y}$

12. Solve the following inequalities. Justify your answers by using a number line or sign chart if needed. Answers without full justification will not receive full credit. Express all answers in interval notation. (12 pts)

(a) $9 - 3x \geq 5x$

(b) $x^4(x - 2)(x + 3) \geq 0$

(c) $|4x - 3| < 5$

END OF EXAM