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. JUST BEFORE YOU UPLOAD TO GRADESCOPE WRITE DOWN YOUR UPLOAD TIME ON THE NEXT PAGE.

iv. WHEN YOU FINISH (IF BEFORE THE EXAM END TIME) PLEASE QUIETLY COLLECT YOUR THINGS AND MOVE TO THE SUBMISSION AREA TO UPLOAD YOUR ANSWERS WITH SUPPORTING WORK TO GRADESCOPE. ONLY WORK THAT'S SUBMITTED TO GRADESCOPE WILL BE GRADED.

1. The following are unrelated: (18 pts)

   (a) Add/Subtract as indicated: $2^0 + \dfrac{3}{8} - \dfrac{1}{12} + 6^{-1}$

   (b) Evaluate the expression: $\dfrac{|7-9|}{2-|-3|}$

   (c) Evaluate the expression: $\sqrt{27}$

   (d) Evaluate the expression: $\sqrt{6}\sqrt{15}$

   (e) Rationalize the denominator: $\dfrac{3}{\sqrt{7}}$

   (f) Add/subtract as indicated (give answer in $a + bi$ form): $i^2 + (-7 + 3i) - \left(-2 + \dfrac{1}{2}i\right)$

2. The following are unrelated: (20 pts)

(a) Simplify: $\sqrt{36x^2y^4}$

(b) Simplify: $(2x-1)^2 + x^5 + 4x - 6 - x^2x^3$.

(c) Multiply: $\left((x+1)^{1/2} + x^{1/2}\right)\left((x+1)^{1/2} + x^{1/2}\right)$

(d) Simplify (Give your answer without negative exponents): $\left(2x^{-2}\right)^3 \dfrac{xy^2}{x^2y^{-3}}$

(e) Is $x = 2$ a solution of $\sqrt{x+2}(x-3)^9(x-1)^7(3) = 6$? Make sure to justify your answer, an answer without work will receive no credit. (4 pts)

3. The following are unrelated: (17 pts)

(a) Factor completely (If not factorable write NF): $y^2 - 16$

(b) Factor completely (If not factorable write NF): $x^3 - 2x^2 + 4x - 8$

(c) Find the domain of the expression: $\dfrac{x^2 - 16}{x(x+4)}$

(d) Simplify the complex fraction: $\dfrac{-\frac{3}{x^2} + \frac{2}{x}}{2 - \frac{1}{x-1}}$

(e) Divide and simplify: $\dfrac{\frac{38}{x^2-x}}{\frac{16}{x^3-x^2}}$

4. Solve each of the following equations: (15 pts)

(a) $x^2 + 12x = -20$

(b) $\sqrt{2 + 2x} = 7 + x$

(c) $x + 4 = 1 + \sqrt{x + 5}$

5. Solve each of the following equations: (10 pts)

(a) $\dfrac{x}{3x^2} + \dfrac{1}{6x} = \dfrac{2-x}{6x^2}$

(b) Solve for M: $\quad 3M - 2PM = 4 + M$

6. Solve the following inequalities. Justify your answers by using a number line or sign chart. Answers without full justification will not receive full credit. Express all answers in interval notation. (20 pts)

(a) $1 - 4x \leq 3$

(b) $(x - 1)^2(x + 3) \geq 0$

(c) $|x - 5| < 0.1$

(d) $\dfrac{-3x}{x + 3} \geq 0$