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: (15 pts)

   (a) Rewrite each of the following without the absolute value symbol:

      i. $|2\pi - 6|$

      ii. $|\sqrt{2} - 2|$

   (b) Use the definition of the distance between two numbers, including absolute value symbol, to write down the distance between $\mathbf{-7}$ and $\mathbf{-4}$, then find the distance.

   (c) Let x, y, and z be real numbers such that $x < 2$, $y < 0$, and $2 \leq z \leq 4$. Answer the following:

      i. Is $-z^4y^3$ positive, negative, or cannot be determined? No work is needed to justify your answer.

      ii. Is x^7y^{23} positive, negative, or cannot be determined? No work is needed to justify your answer.

      iii. Is $z - 5 + y$ positive, negative, or cannot be determined? No work is needed to justify your answer.

   (d) Add and simplify: $\dfrac{2}{\frac{9}{7}} + \dfrac{5}{12} + 7^0$

   (e) Simplify: $\dfrac{|-7-3|+|2|}{2|-4|}$

2. The following are unrelated. Leave your answers without negative exponents. (20 pts)

(a) $(-5b^3)^2 7a^{-3}a^6$

(b) Simplify: $\dfrac{\sqrt{32x^2}}{\sqrt{2\sqrt{16}}}$

(c) Simplify: $\dfrac{2(x^{-2}y^3)^3}{8x^{-3}y^{-1/3}}$

(d) Multiply to rewrite as a polynomial: $\left(\sqrt{x-1}+3\right)\left(\sqrt{x-1}-3\right)$

3. The following are unrelated: (12 pts)

(a) Find the domain of the expression (give your answer in interval notation): $\dfrac{x^2-9}{\sqrt{x}(x-3)}$

(b) Combine into a single fraction: $\dfrac{1}{x^2-x-2}-\dfrac{3}{x+1}$

(c) Evaluate the expression: $-\dfrac{1}{2}x^2-x^{-1}$ when $x=-4$

4. The following are unrelated: (12 pts)

(a) Simplify: $\dfrac{3x^2+12}{x^2-5x} \cdot \dfrac{x^2-3x-10}{x^2+4}$

(b) Simplify the compound fraction: $\dfrac{\frac{3}{x^2}-\frac{1}{x}}{\frac{9}{x^2}-1}$

(c) Factor by grouping: $9x^3-18x^2-4x+8$

5. Is $x=-2$ a solution of the inequality $x^3-2x<2x$? (3 pts)

6. Solve each of the following equations. If there are no solutions write NO SOLUTIONS: (15 pts)

(a) $-2x - 4 = 1 + 4x$

(b) $\dfrac{3}{x-2} = \dfrac{x}{x^2-4}$

(c) $|2x - 3| = 3$

7. Solve each of the following equations. If there are no solutions write NO SOLUTIONS: (10 pts)

(a) $\sqrt{8-y}+2=y-4$

(b) Solve for h: $P=A+hdg$

8. 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. (8 pts)

(a) $-3x+1<6$

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

EXAM CONTINUED ON BACK SIDE

9. Find all the solutions to the following equation, including the complex solutions (Hint: factoring will be important) $z^3 = 1$. (5 pts)