

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. **Assume all questions have answers in the real numbers unless the instructions specify complex numbers.**

1. Please write the word “agree” to indicate that you will abide by the University honor code for this exam.

2. The following are unrelated:

(a) Simplify to rewrite as a polynomial: $z^2 - 2 - (3z^2 - 1)^2$ (6 pts)

(b) Simplify: $\frac{1}{\sqrt{x}} \left(x^{1/2} - \frac{1}{\sqrt{x}} \right)$ (6 pts)

(c) Simplify: $\frac{(-3t^3)^2 r^{5/2}}{r^{-1/4}}$ (7 pts)

(d) Simplify the complex fraction: $\frac{\frac{3}{x-2} + 1}{\frac{1}{x-2} - 2}$ (7 pts)

(e) Rewrite in $a + bi$ form: $(2 - 3i)(1 + i)$ (6 pts)

3. Solve each of the following equations:

(a) $-3(2 - x) = 7x$ (7 pts)

(b) $x^2 - 8x = -16$ (7 pts)

(c) $\frac{1}{x-5} - \frac{5}{x(x-5)} = 1$ (7 pts)

(d) Solve for p : $\frac{p}{q} + p = 2q$ (7 pts)

4. For the given equation of a circle, $x^2 + y^2 = 1$, find the equation of the upper half of the circle. (7 pts)

5. Solve the following inequalities. Give all final answers in interval notation.

(a) $x^2 > 9$ (7 pts)

(b) $23 \leq 5x - 3$ (7 pts)

(c) $\frac{-2}{x-3} \geq 0$ (7 pts)

6. (a) Graph the two points $A(5, 3)$ and $B(1, -2)$ on the xy axes. Clearly label values on the axes. (6 pts)

(b) Find the midpoint between the two points. (6 pts)

End of exam. Formula sheet on Next Page

Potentially useful formulas:

(i) Equation of a circle: $(x - h)^2 + (y - k)^2 = r^2$

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

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

(iv) The quadratic formula: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$