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, and electronic devices 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.

Name: _____ Upload time: _____

1. The following are unrelated: (32 pts)

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

   (b) Multiply: $\left(x^{1/2} + x^{3/2}\right)^2$

   (c) Simplify: $\dfrac{a^6}{a^{-3}} \dfrac{(3a)^{-2}}{6}$

   (d) Factor completely (If not factorable write NF): $y^3 + 27x^3$

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

(f) Simplify the complex fraction: $\dfrac{\frac{x}{x+2} - \frac{4}{x+2}}{\frac{6}{x+2} - 3}$

(g) Rationalize the denominator: $\dfrac{3 - \sqrt{x}}{3 + \sqrt{x}}$

(h) Simplify: $(1 - 2i)(1 + 2i) - 3i^4$

(i) Let c be a real number. Find the value of c that makes the factoring of the polynomial true:
$2x^2 - cx - 6 = (2x - 3)(x + 2)$

2. Simplify: $\dfrac{4x(2x-1)(-2)+3x(2x)^2x}{2x}$ (5 pts)

3. Solve each of the following equations: (25 pts)

   (a) $5 = x^2 - 4x$

   (b) $\sqrt{x} - 2 = x - 2$

   (c) $\dfrac{x}{x^2-1} + \dfrac{1}{2(x+1)} = \dfrac{x-1}{x^2-1}$

(d) Solve for P: $3 - 14P = -RP - 1$

(e) Solve for r: $I = \dfrac{S}{4\pi r^2}$

4. 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)

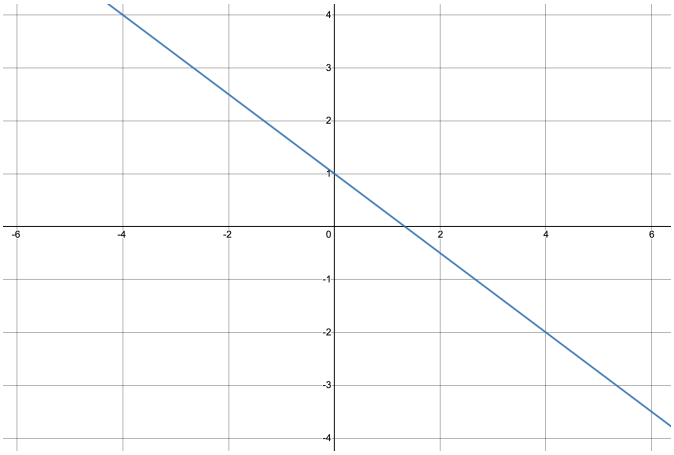
(a) $2 + 5x \leq -x - 1$

(b) $x(x-2)^2(x+2) < 0$

(c) $\left|2x + \dfrac{1}{2}\right| < \dfrac{1}{2}$

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

5. For the graph of the line below answer the following: (6 pts)

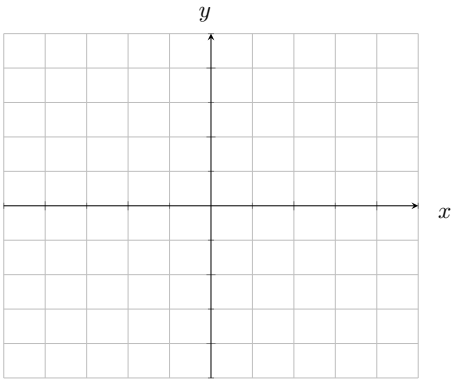


(a) Find the slope of the line.

(b) Find the equation of the line in $y = mx + b$ (slope-intercept) form.

6. Find the distance between $(-2, 1)$ and $(0, 7)$. (3 pts)

7. Graph the line that has slope $m = -\frac{1}{3}$ and crosses through the point $\left(-\frac{3}{2}, 2\right)$. Be sure to label relevant values on the axes. (4 pts)



8. Find the value(s) for d such that the midpoint between $(d, -5)$ and $(-1, 3)$ is $\left(\frac{5}{2}, -1\right)$. (5 pts)