By providing my signature below I acknowledge that I abide by the University's academic honesty policy. This is my work, and I did not get any help from anyone else during the exam:

Name (sign): _____ Name (print): _____

Student Number: _____

Instructor's Name: _____ Class Time: _____

Problem Number	Points Possible	Points Made
1	0	
2	15	
3	20	
4	15	
5	20	
6	10	
7	10	
8	10	
Total:	100	

- If you need extra space use the last page.
- Please show your work. **An unjustified answer may receive little or no credit.**
- If you make use of a theorem to justify a conclusion then state the theorem used by name.
- Your work must be **neat**. If I can't read it (or can't find it), I can't grade it.
- The total number of possible points that is assigned for each problem is shown here. The number of points for each subproblem is shown within the exam.
- Please turn off your mobile phone.
- A calculator is not necessary, but numerical answers should be given in a form that can be directly entered into a calculator.
- Common identities:

$$\begin{aligned}\cos(\alpha+\beta) &= \cos(\alpha)\cos(\beta)-\sin(\alpha)\sin(\beta),\\ \sin(\alpha+\beta) &= \sin(\alpha)\cos(\beta)+\cos(\alpha)\sin(\beta).\end{aligned}$$

1. [2 Bonus] Common Knowledge: How will the FDJ-Suez team manage all the large egos of their riders during the 2025 season?

2. Determine all of the values of x for each question below that satisfy the given equation. If no values of x satisfy the equation provide a brief justification as to how you arrived at your conclusion.

(a) [5 pts] $8x + 1 = 4 - x$.

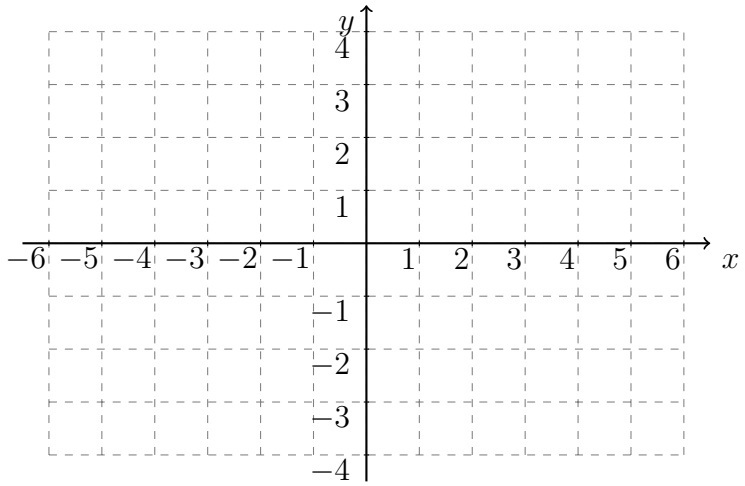
(b) [5 pts] $x^2 = 3x - 1$.

(c) [5 pts] $7 = |3 - 2x|$.

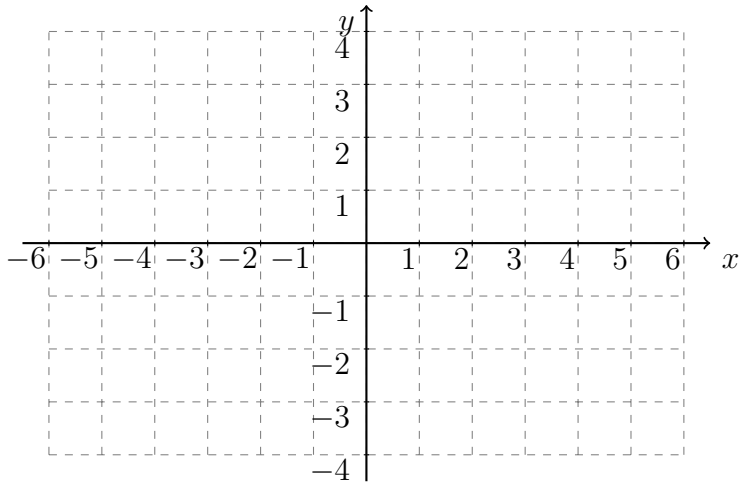
3. A function, $g(x)$, is defined to be

$$g(x) = \begin{cases} \sqrt{-x} - 1 & -4 < x \leq 0, \\ x + 2 & 0 < x \leq 2. \end{cases}$$

(a) [5 pts] Use the axes below to make a sketch of the graph of $g(x)$.



(b) [5 pts] Use the axes below to make a sketch of the graph of $g(x-3)-2$.



(c) [5 pts] Determine the domain and range of $g(x)$. (Your answers should be in interval notation.)

(d) [5 pts] Determine the x and y-intercepts of $g(x)$. (Your answers should be coordinates.)

4. Determine equations for each of the functions in the descriptions that follow.

   (a) [5 pts] The quadratic function whose vertex is $(4, -2)$ and the y value of the y-intercept is 13.

   (b) [5 pts] The line that includes the points $(-5, 2)$ and $(3, 6)$.

   (c) [5 pts] A rectangle has a perimeter of 10 units. Determine the function that returns the area of the rectangle given the **length of one side**.

5. A quadratic function is defined as

$$q(x) = 4x^2 + 16x + 2.$$

(a) [5 pts] Rewrite the function in vertex form by completing the squares.

(b) [5 pts] Determine the vertex of the quadratic.

(c) [5 pts] Determine the domain and range of the function, $q(x)$.

(d) [5 pts] Determine the values of x where the function is increasing and the values of x where the function is decreasing. (Your answers should be in interval notation.)

6. A machine produces paper, and the paper is delivered as one large roll that is 20 feet wide. At the start of a shift there is 150 linear feet on the roll. (The number of linear feet is the length of one side of the roll if it were unrolled as one long sheet.) The machine produces 120 linear feet per hour.

   (a) [5 pts] Determine the function that returns the number of linear feet on the roll in hours after the start of the shift.

   (b) [5 pts] The likelihood that the machine experiences a problem depends on the number of linear feet on the roll. If L is the number of linear feet, then the likelihood is given by

$$p(L) = \frac{2+L}{8+L}.$$

   Determine the likelihood that there is a problem given the number of hours after the start of the shift.

7. [10 pts] The equation for a line is given by

$$y - 3 \;=\; m(x + 1).$$

Determine the possible range of values for m so that the x-intercept of the line will have a positive x value. (Your answer should be in interval notation.)

8. [10 pts] Two securities will be purchased, and a total of \$100,000 will be spent to purchase the securities. The cost of the first security is \$40 per share. The cost of the second security is \$20 per share. (It is possible to purchases fractions of a share.) The risk of the shares depend on how many are purchased:

   Risk of security 1 If x shares are purchased of security 1, then its risk is $10500 - 2x$.

   Risk of security 2 If y shares are purchased of security 2, then its risk is $6000 - y$.

   The total risk is the product associated with the risk for security 1 and the risk for security 2. Determine how many shares of each security to purchase that will minimize the risk.

Extra space for work. **Do not detach this page.** If you want us to consider the work on this page you should print your name, instructor and class meeting time below.

Name (print): _____ Instructor (print): _____ Time: _____