

Print and sign a brief statement stating this is your work and you used no other resource:

Name (sign): _____

Name (print): _____

Student Number: _____

Instructor's Name: _____

Class Time: _____

Problem Number	Points Possible	Points Made
??	0	
??	21	
??	20	
??	10	
??	16	
??	5	
??	18	
??	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:

$$\cos(\alpha + \beta) = \cos(\alpha) \cos(\beta) - \sin(\alpha) \sin(\beta), \quad \sin(\alpha + \beta) = \sin(\alpha) \cos(\beta) + \cos(\alpha) \sin(\beta).$$

1. Common Knowledge: Who is the women's road cycling champion of Colombia?

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)

$$\sqrt{4 - 6x} = 7.$$

(b)

$$7 = \frac{1}{3 - x}.$$

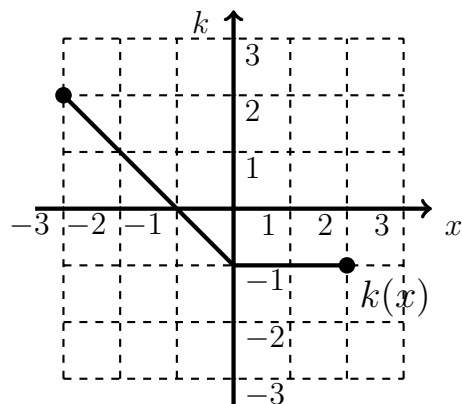
(c)

$$|2x + 1| = 9.$$

(d)

$$\sqrt{2 - 6x} = x.$$

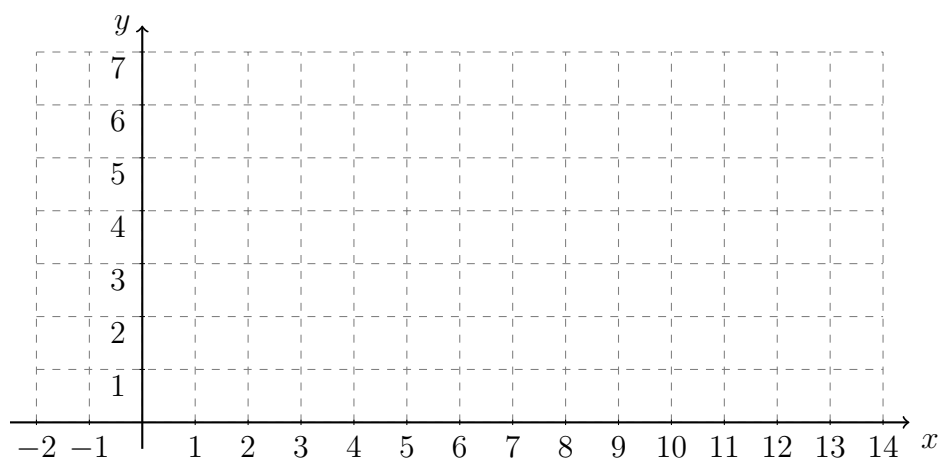
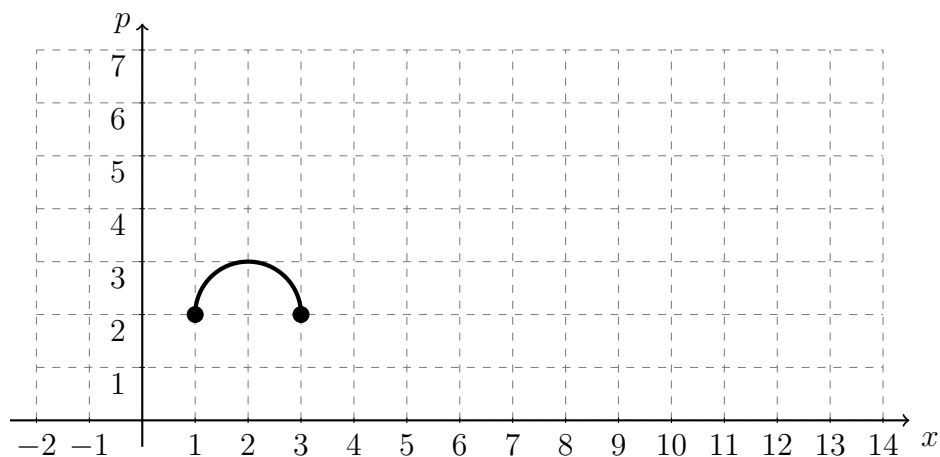
3. Two functions, $k(x)$ and $m(x)$, are given below. Use the functions to answer each of the questions below.



$$m(x) = \begin{cases} -x + 3 & x < 0 \\ \sqrt{x} & x \geq 0 \end{cases}$$

- (a) Determine the value of $m(k(-2))$
- (b) Determine the value of $k(m(-2))$
- (c) What is the domain of the function $\frac{m(x)}{k(x)}$?
- (d) For what values of x is the function $m(k(x))$ increasing? (Briefly explain your reasoning.)

4. The graph of a function, $p(x)$, is shown in the diagram below. Make a rough sketch of the function $2p\left(\frac{1}{3}x + 1\right)$ using the empty axes below.



5. For each question below a function is described. Use the description to determine an equation for the function.
- (a) A parabola that is increasing when $x < 5$ and decreasing when $x > 5$. The maximum y -value is -3, and the coordinate $(7, -5)$ is on the graph of the parabola.

- (b) A square root function, but it is shifted left 5 units and up 2 units.

6. A formula for a line is given by

$$y - 1 = m(x + 2),$$

where m is a constant. What are the possible values of m that will guarantee that the y value of the y -intercept will be greater than 2? (Hint: make a rough sketch of the situation.)

7.

A company sells towels. If fewer than sixty towels are ordered the cost per towel is \$8.00 each plus a \$2.50 surcharge¹. If sixty or more towels are ordered the cost per towel is \$6.00 each with a \$0.50 surcharge.

- (a) Determine the cost of an order given that x towels are ordered. Express the cost as a piecewise defined function.

- (b) Determine the average rate of change from an order of 55 towels to 80 towels.

- (c) If you are given the total cost for an order is it always possible to determine the number of towels? (Explain your reasoning.)

¹A surcharge is a single value that is added to the total order after all charges are calculated.

8.

A factory produces two products, product A and product B. The factory is capable of producing a total of 2,000 products in one day. To calculate the profit for producing product A calculate two-thousand times the number produced and then subtract the number produced squared (ex: $2000x - x^2$). To calculate the profit for producing product B calculate three-thousand times the number produced and then subtract the number produced squared (ex: $3000y - y^2$). How many of each item should be produced to maximize the total profit?

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: _____