

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	21	
3	20	
4	10	
5	16	
6	5	
7	18	
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: 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.

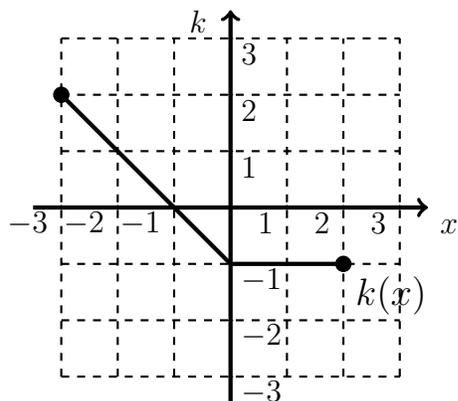
_____ (a) [5 pts] $\sqrt{4 - 6x} = 7$.

_____ (b) [5 pts] $7 = \frac{1}{3 - x}$.

_____ (c) [5 pts] $|2x + 1| = 9$.

_____ (d) [6 pts] $\sqrt{2 - 6x} = x$.

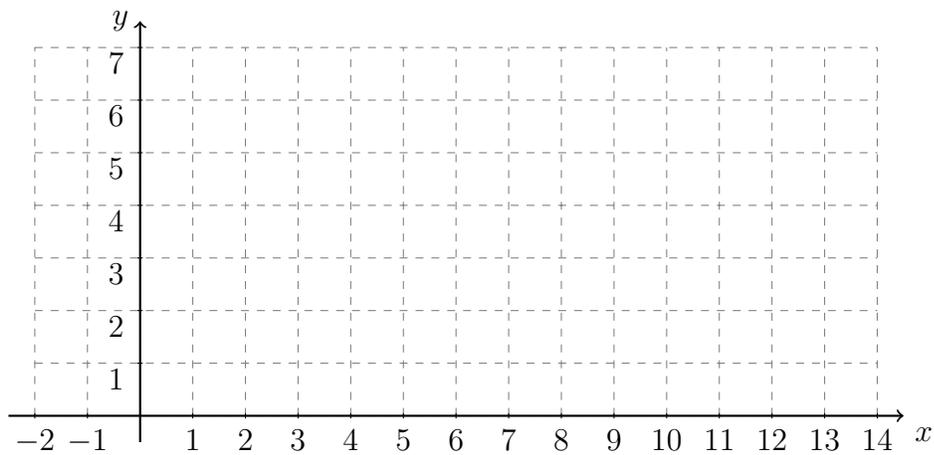
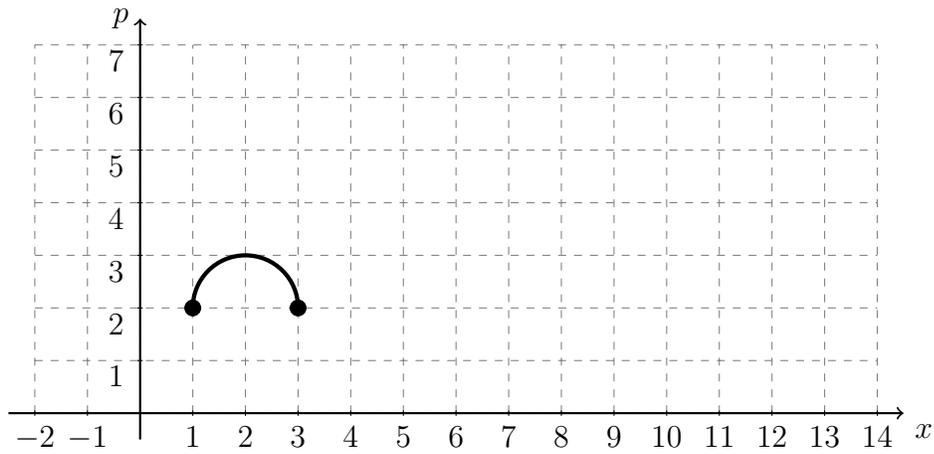
3. Two functions, $k(x)$ and $m(x)$, are given below. Use the functions to answer each of the questions below.



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

- (a) [6 pts] Determine the value of $m(k(-2))$
- (b) [6 pts] Determine the value of $k(m(-2))$
- (c) [6 pts] What is the domain of the function $\frac{m(x)}{k(x)}$?
- (d) [2 pts] For what values of x is the function $m(k(x))$ increasing? (Briefly explain your reasoning.)

4. [10 pts] 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) [8 pts] 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) [8 pts] A square root function, but it is shifted left 5 units and up 2 units.

6. [5 pts] 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) [8 pts] Determine the cost of an order given that x towels are ordered. Express the cost as a piecewise defined function.

(b) [8 pts] Determine the average rate of change from an order of 55 towels to 80 towels.

(c) [2 pts] 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. [10 pts] 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: _____