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	20	
3	20	
4	10	
5	10	
6	15	
7	15	
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: Will Lotte Kopecky suffer from the curse of the rainbow jersey?

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.

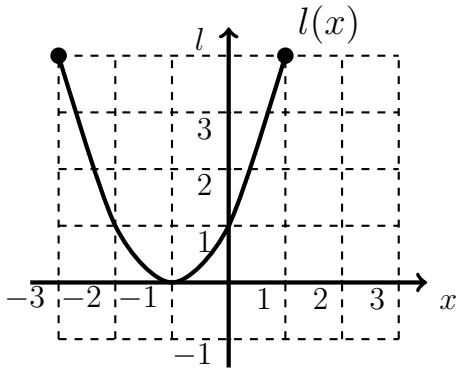
(a) [5 pts] $\dfrac{1}{\sqrt{x+1}} = 4.$

(b) [5 pts] $8x^2 - 5 = x.$

(c) [5 pts] $\dfrac{1}{3+x} = \dfrac{2}{5-x}.$

(d) [5 pts] $|3x - 1| = 7.$

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



$$k(x) = |x+1|.$$

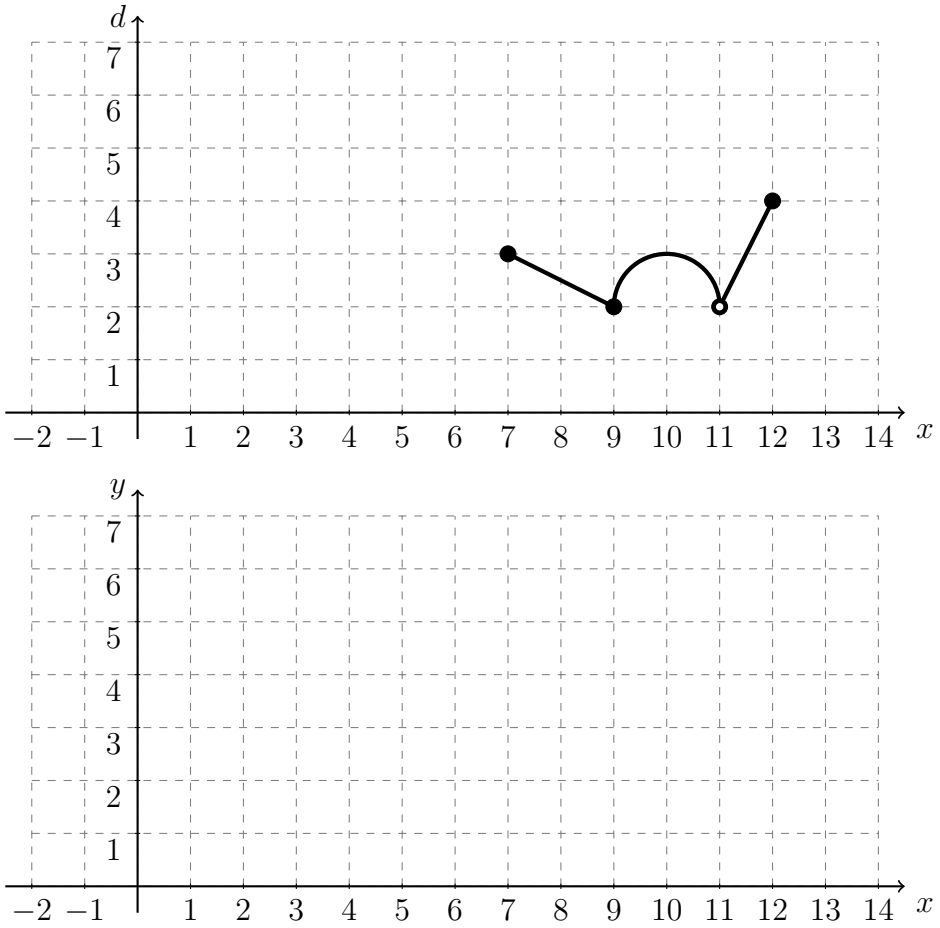
(a) [5 pts] Determine the domain and range of $l(x)$.

(b) [5 pts] Determine the domain and range of $l(x-1)-3$.

(c) [5 pts] For what values of x is $k(x)$ increasing?

(d) [5 pts] Determine the domain and range of $l(k(x))$.

4. (a) [5 pts] The graph of a function, $d(x)$, is shown in the diagram below. Make a rough sketch of the function $d\left(\frac{1}{2}x + 8\right) + 3$ using the empty axes below.



(b) [5 pts] Determine the transformation of the original function, $d(x)$, that will shift the function left four units, down two units, and expand it horizontally by a factor of three. Express the resulting function in terms of the function $d(x)$.

5. A rectangular area will be marked off using a fence. One side of the rectangle will have length x, and one side will have length y. The area of the rectangle will be 100 meters^2.

   (a) [5 pts] Determine the function y in terms of x.

   (b) [5 pts] Make a rough sketch of the function. (Draw and label your axes in the space below.)

6. Two quadratic functions are given below:

$$\begin{aligned} Q(x) &= x^2 + mx - 2m, \\ R(x) &= (x-3)^2 + b, \end{aligned}$$

where m and b are real numbers.

(a) [5 pts] Determine the (x, y) coordinate for the vertex of $Q(x)$.

(b) [5 pts] Determine the values of x where $Q(x)$ is decreasing.

(c) [5 pts] Determine all values of b so that the y value of the vertex of $R(x)$ is less than the y value of the vertex of $Q(x)$.

7. A vendor sells a refreshing beverage at an event. The cost of a booth for the event is \$200.00, and the beverage costs \$3.50 per liter to produce.

   (a) [5 pts] The vendor plans on taking some amount of the beverage, l liters, to the event. Determine the function that returns the cost associated with taking l liters of the beverage to the event.

   (b) [5 pts] If the vendor plans on spending at most \$1,000.00 to prepare for the event. What is the greatest number of liters of beverage that can be produced?

   (c) [5 pts] Suppose the vendor instead decides to take two-hundred liters of beverage to the event. How much should the vendor charge, per liter, to make a total of \$350.00 profit for the event assuming all of the beverage is sold.

8. [10 pts] A play area will be constructed for children to play within in it. The area will be built in the shape of a rectangle. The rectangle will be enclosed in a fence except one-third of the length on one side will be open and not have a fence. A total of eighty meters of fence will be used. Determine the dimensions that will result in the largest possible area. (Show all your work and justify your results.)

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: _____