

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               |             |
| ??             | 15              |             |
| ??             | 15              |             |
| ??             | 15              |             |
| ??             | 10              |             |
| ??             | 10              |             |
| ??             | 15              |             |
| ??             | 10              |             |
| ??             | 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: Which is your favourite rivalry that will be rekindled due to the 2021 NHL division changes?

- (a) 2. Determine all of the values of  $x$  for each question below that satisfy the given equation.
- $$\sqrt{8x + 3} = 7.$$

\_\_\_\_\_

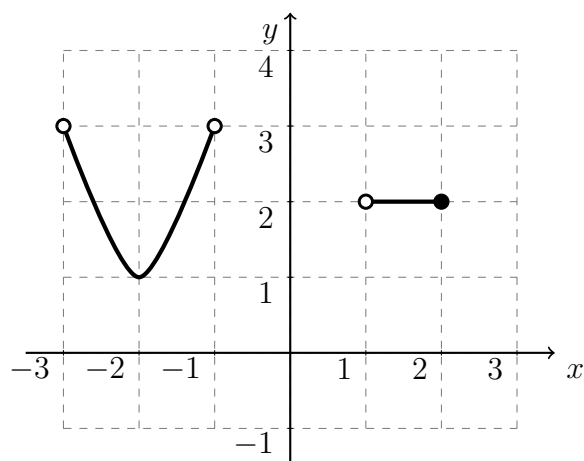
- (b) 
$$\frac{1}{\sqrt{3x - 5}} = 7$$

\_\_\_\_\_

- (c) 
$$\frac{x}{x + 1} = \frac{3}{x}$$

\_\_\_\_\_

3. The graph of a function,  $h(x)$ , is given below. Use the graph to answer each of the questions below.



(a)

Determine the domain and range of  $h(x)$ .

\_\_\_\_\_

(b)

Determine the intervals where the function is increasing and the intervals where the function is decreasing.

\_\_\_\_\_

(c)

Determine the formula for the function using proper notation for a piecewise defined function. (The curved part to the left is a parabola.)

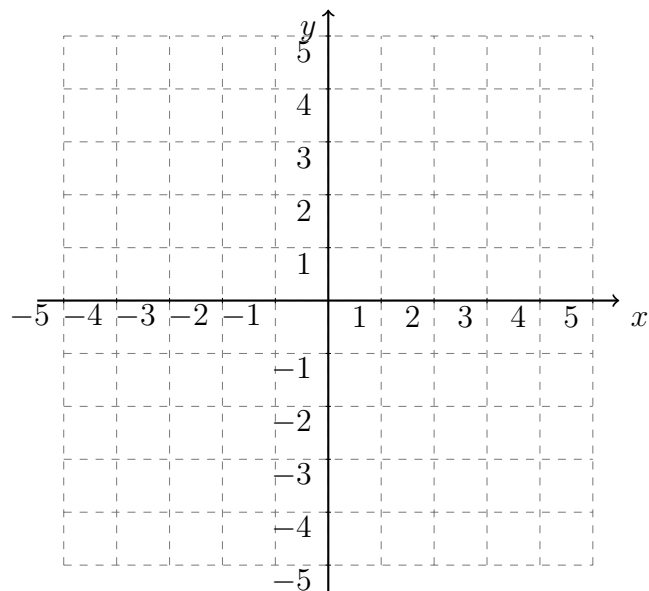
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4. The questions below refer to the function

$$k(x) = 2x^2 - 12x + 14.$$

(a)

Sketch the function using the axes below.



(b)

Express the function in vertex form.

(c)

Determine any intervals where the function is increasing, any intervals where the function is decreasing, and determine the vertex of the parabola.

5. Two functions,  $r$  and  $s$  are given below. Use the functions to answer each of the following questions. If a value does not exist briefly explain why.

(a) 
$$r(x) = \frac{1}{x}, \qquad s(x) = x + 3$$

Determine the domain and range of  $r(x)$ .

\_\_\_\_\_

Determine the domain and range of  $r(s(x))$ .

(b)

\_\_\_\_\_

6.

The equations for two quadratic functions are the following:

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$$\text{Quadratic 1 : } Q_1(x) = 3(x - a)^2 + 7,$$

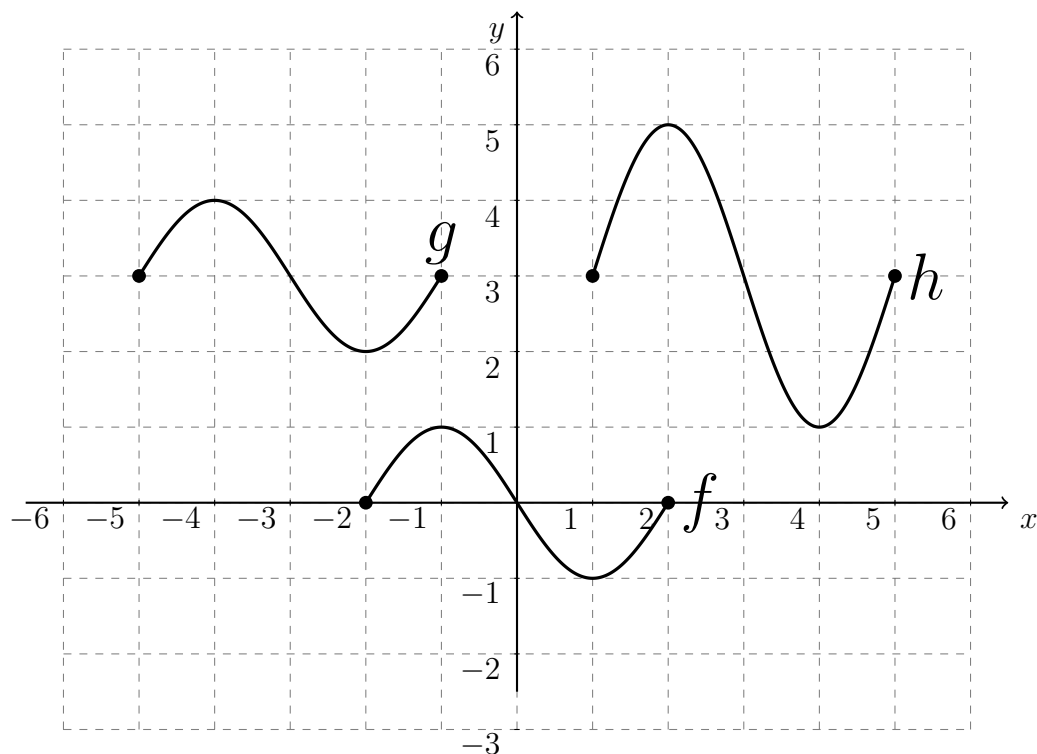
$$\text{Quadratic 2 : } Q_2(x) = 3(x - 2)^2 + 7,$$

where  $a$  is a constant. Answer each question below and provide a brief justification for your answer.

- (a) Does the vertex of  $Q_1$  represent a local minimum or a local maximum? (Briefly justify your conclusion.)

- (b) What values of  $a$  will ensure that  $Q_1(x) > Q_2(x)$  when  $x > 2$ ? (Briefly justify your conclusion.)

7. The graphs of three functions,  $f$ ,  $g$ , and  $h$ , are given in the plot below.



(a)

The function  $g$  can be written in terms of  $f$  as  $g(x) = Af(c \cdot x + d) + B$ . Determine the values of  $A$ ,  $B$ ,  $c$ , and  $d$ .

(b)

The function  $h$  can be written in terms of  $f$  as  $h(x) = Af(c \cdot x + d) + B$ . Determine the values of  $A$ ,  $B$ ,  $c$ , and  $d$ .

(c)

Use the axes above to make a rough sketch of the function  $u(x) = f(2x + 3) - 2$ .

8. The cost to produce  $x$  items is a linear function of  $x$ . Two vendors submit bids to produce a widget. Company A will provide 1000 items at a cost of \$7,500, and the cost will increase by \$0.90 per each additional item. Company B will provide 900 items at a cost of \$7600, and they will provide 1200 items at a cost of \$7,780.

(a)

Determine the functions that provide the cost given the number of items produced by company A as well as company B.

(b)

If you wish to order 1400 items which company offers the better deal assuming the quality will be the same? (Provide a full justification for your answer.)

9.

The Fowl Corporation will be updating its feed guidance that will be sent to its associates. The goal is to find the balance of corn and soy feed that will result in the largest weight gain for a chicken. In a given time period it is estimated that a chicken will consume a total of 5,000 calories. Each kilogram of corn feed provides 1000 calories, and each kilogram of soy feed provides 800 calories. The total weight gain over the time period is approximated by the amount of corn feed multiplied by the amount of soy feed. Determine the balance of corn and soy feed that will result in the largest weight gain for a chicken.

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: \_\_\_\_\_