

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	
??	20	
??	15	
??	10	
??	15	
??	15	
??	15	
??	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**. This will make it easier to properly grade and give you the credit you deserve.
- 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: Will Fem Van Empel return to professional cycling? If so, when will she return?

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) $3 - 4x^2 = 2$.

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

(c) $8x^2 = 3x + 1.$

(d) $\frac{1}{\sqrt{5+2x}} = \frac{1}{\sqrt{1+x}}.$

3. Three functions, $f(x)$, $g(x)$, and $h(x)$ have the following properties:

- The domain of $f(x)$ is $(-3, 8)$, and the range of $f(x)$ is $(-1, 1)$.
- The domain of $g(x)$ is $(-5, 2)$, and the range of $g(x)$ is $(4, 6]$.
- $h(x) = \frac{1}{x}$.

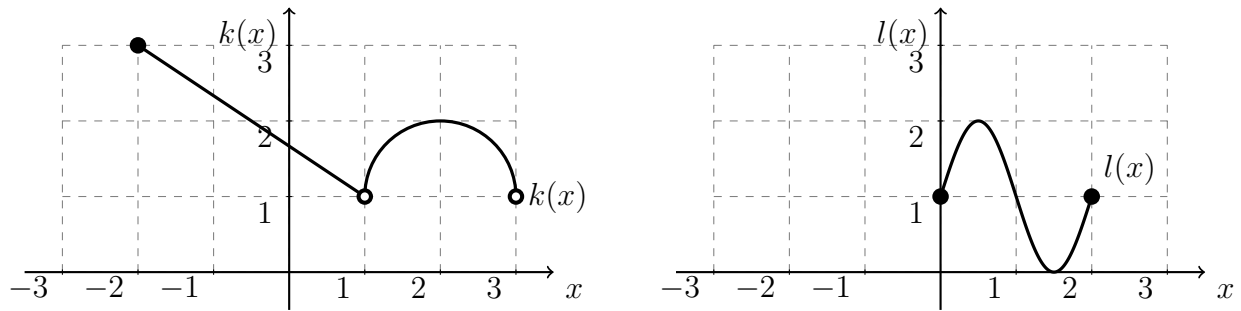
Answer each of the following questions. If it is not possible to answer a question briefly state why this is the case. (Your answers should be in interval notation.)

(a) Determine the domain of the function $f(x) + g(x)$.

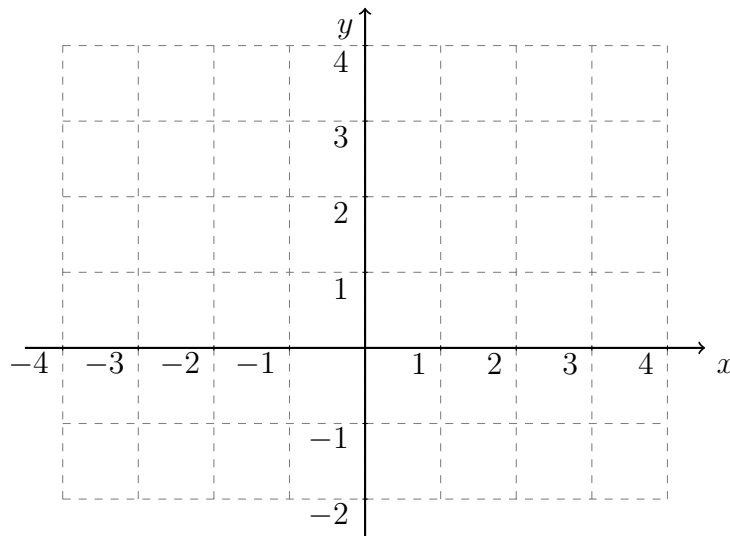
(b) Determine the domain of the function $\frac{f(x)}{h(x)}$.

(c) Determine the domain of the function $\frac{g(x)}{f(x)}$.

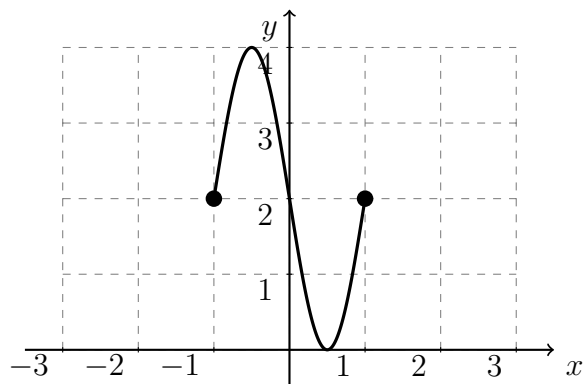
4. The graphs of two functions, $k(x)$ and $l(x)$, are shown below. Use the graphs to answer each of the questions below.



- (a) Make a sketch of the function $2k(x - 1) - 3$ using the axes below.



- (b) The graph of a new function is shown in the figure below. Determine a transformation that will transform $l(x)$ to match the figure.



5. Two functions are given below,

$$\begin{aligned}r(x) &= 5x^2 + 2x + 1, \\s(x) &= a(x + 3)^2 - 2,\end{aligned}$$

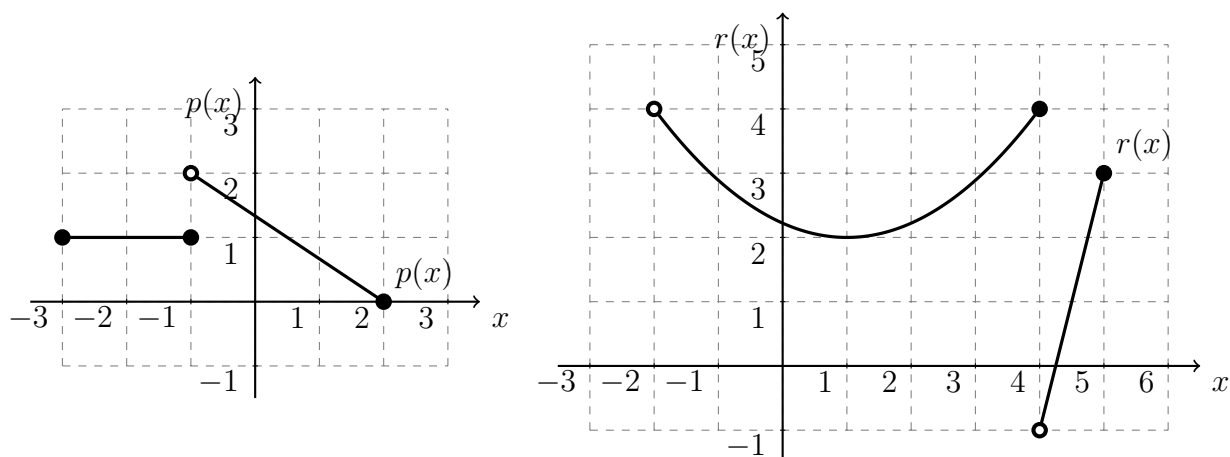
where a is a constant number. Use these two equations to answer each of the following questions.

(a) Determine the average rate of change of $r(x)$ between $x = 1$ and $x = 3$.

(b) Determine the interval(s) where the function $r(x)$ is increasing.

(c) What values of a will ensure that $s(x)$ has two x -intercepts. (Your answer should be in interval notation.)

6. Two functions, $p(x)$ and $r(x)$, are shown in the figure below. Use the functions to answer each of the questions below.



- (a) Determine the value of $r(p(-1.5))$.
- (b) Determine the value of $p(r(4))$.
- (c) Express the function, $r(x)$ using piecewise defined notation. (The segment on the left is a quadratic function.)

7. A small insect is initially at the coordinate $(-1, 3)$. The insect moves to the right (in the positive x -direction) at a constant 2 meters each hour. (The insect's y coordinate does not change.)

(a) Determine the value of the insect's x coordinate at any time in hours after the insect starts to move.

(b) Determine the distance between the insect and the origin given the time in hours after the insect starts to move.

(c) At what time is the distance between the insect and the origin the smallest?

8. A fund manager has two securities, A and B, that they wish to purchase. The manager must determine what proportion, x , of security A and what proportion, y , of security B to purchase. The two proportions should add up to 1 (or 100%). (Each proportion is between 0 and 1.) The total variation in the expected earnings will be

$$\text{variation} = 3x^2 + xy + 2y^2.$$

Determine what proportions the manager should purchase in order to minimize the variation in expected earnings.

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: _____