

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	15	
3	10	
4	14	
5	15	
6	15	
7	17	
8	14	
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: How many orbits has Pluto completed since its discovery?

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]  $\frac{x}{x+2} = 4.$

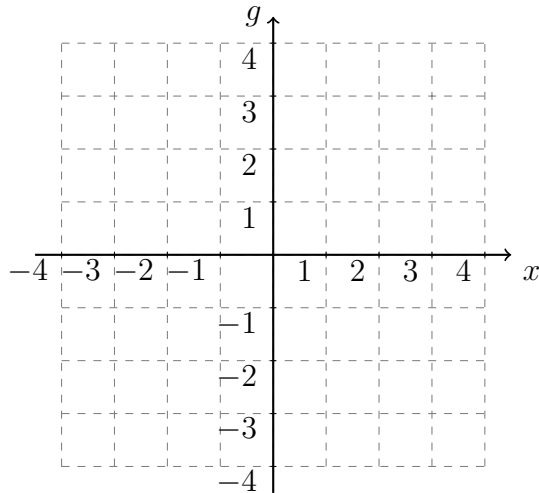
\_\_\_\_\_ (b) [5 pts]  $\sqrt{4-x} = x.$

\_\_\_\_\_ (c) [5 pts]  $|x+3| = 7$

3. The questions below refer to the function

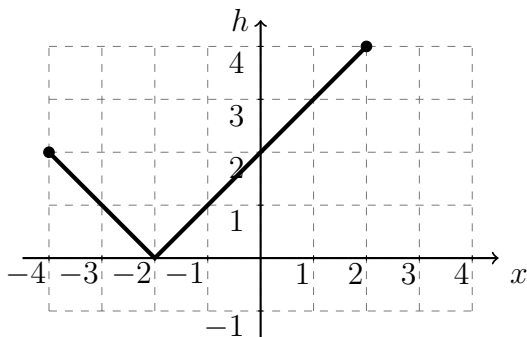
$$g(x) = \begin{cases} x + 3 & -3 \leq x < -1, \\ -x^2 + 4x - 2 & 0 < x \leq 3. \end{cases}$$

\_\_\_\_\_ (a) [5 pts] Make a rough sketch of the graph of the function,  $g(x)$ , using the axis below.



\_\_\_\_\_ (b) [5 pts] Determine the range and domain of the function,  $g(x)$ .

4. Two functions are given below. The graph of  $h(x)$  is on the left, and the function  $s(x)$  is defined on the right.



$$s(x) = x^2 - 4.$$

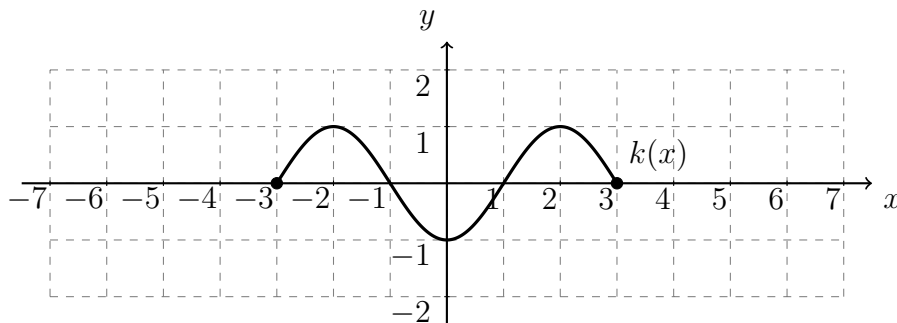
- \_\_\_\_\_ (a) [5 pts] Determine the value of  $s(h(-2))$ .

- \_\_\_\_\_ (b) [5 pts] Determine the value of  $h(s(-2))$ .

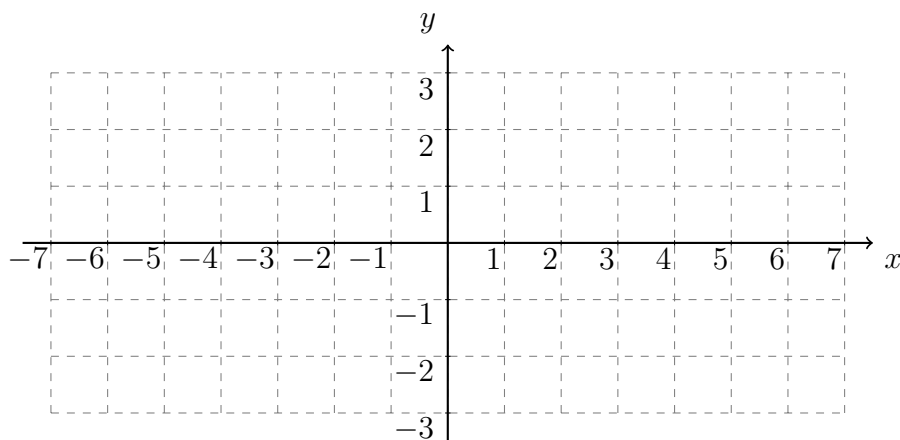
- \_\_\_\_\_ (c) [2 pts] Determine the  $y$ -intercepts of  $h(s(x))$ .

- \_\_\_\_\_ (d) [2 pts] Determine the  $x$ -intercepts of  $h(s(x))$ .

5. The questions below refer to the following graph of a function,  $k(x)$ .

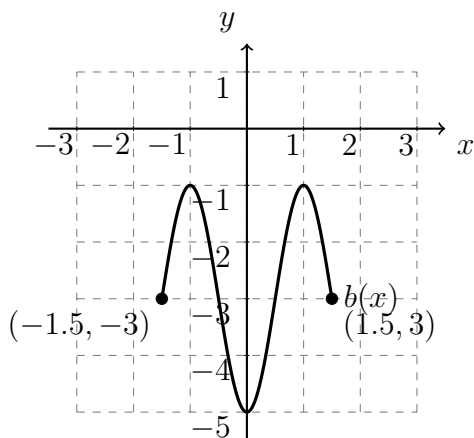


\_\_\_\_\_ (a) [10 pts] use the axes below to sketch a graph of the function  $k(x - 3) + 1$ .



\_\_\_\_\_ (b) [5 pts] The graph of the function  $b(x)$  is given below. Determine the values of  $a$ ,  $b$ ,  $c$ , and  $d$  so that

$$b(x) = ak(bx + c) + d.$$



6. The questions below refer to the function

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$$p(x) = 3x^2 - 2x + 1.$$

(a) [5 pts] Determine the average rate of change from  $x = 1$  to  $x = 3$ .

(b) [5 pts] Determine a formula for the secant line through the points on the graph of the function  $p(x)$  at  $x = 1$  and  $x = 3$ .

(c) [5 pts] For what values of  $x$  is  $p(x)$  increasing and what values is it decreasing? Also determine the values of  $x$  where a local minima or local maxima occur including a brief justification why the points are a minima or a maxima.

7. A company will rent temporary office space. The cost to rent a floor of a building is a fixed \$60,000 for the first four weeks. After the first four weeks the cost is an additional \$12,500 per week.

\_\_\_\_\_ (a) [9 pts] Determine the function that provides the total cost to rent the floor for a given number of weeks,  $t$ . Express your function using proper piecewise function notation.

\_\_\_\_\_ (b) [8 pts] A design group will pay \$98,000 to rent the floor. How long can they use the floor?

8. [14 pts] Determine the two numbers that sum to fifteen whose product is as large as possible.  
(Justify your solution and do not state an intuitive guess.)
- \_\_\_\_\_



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: \_\_\_\_\_