Math 1148
Autumn 2017
Midterm 2
Form A

Name: ______________________

Name.nn: ______________________

Lecturer: ______________________

Rec. Instructor: ______________________

Rec. Time: ______________________

Instructions:

- You have **55 minutes** to complete this exam. It consists of 10 questions on 8 pages including this cover sheet and is worth a total of 100 points. The value of each question is listed below and with each question. Partial credit might not be awarded on some questions.
- You may not use any books, notes or self-supplied scratch paper during this exam.
- Calculators are permitted EXCEPT those calculators that have symbolic algebra or calculus capabilities. In particular, the following calculators and their upgrades are not permitted: TI-89, TI-92, and HP-49. In addition, neither PDAs, laptops nor cell phones are permitted.
- Make sure to read each question carefully.
- Please **write clearly** and make sure to **justify your answers**. Correct answers with no supporting work may receive no credit. If you find a solution to a problem using a graph from your calculator (where appropriate), you need to sketch that graph and label all relevant information.
- Unless otherwise specified, make sure your answers are in **exact form** (i.e. not decimal approximations).
- Make sure to **circle** your answers.
- A random sample of graded exams will be xeroxed before being returned.

Question:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	Total
Points:	9	6	14	8	7	9	8	10	18	11	100
Score:											

(1). Suppose that $f(x) = 5x^2 - 20x + 3$

(**a**) (7 points) Write $f(x)$ in vertex form.

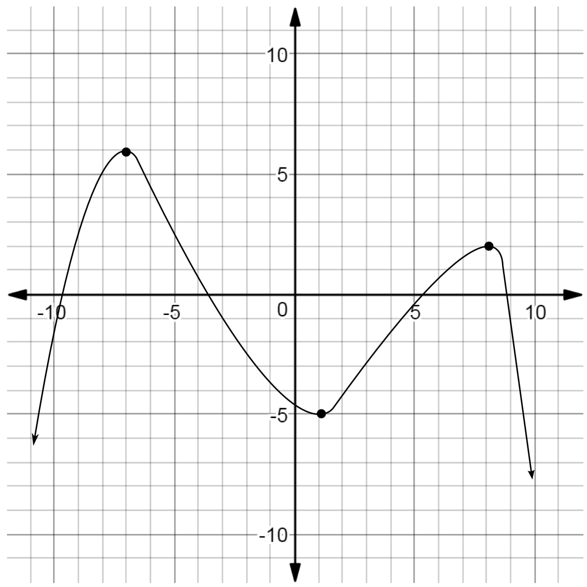
(**b**) (2 points) Identify the vertex.

(2). The following questions concern revenue.

(**a**) (2 points) Suppose that a manufacturer is able to sell $n(p) = 80 - 3p$ items when the unit price (in dollars) is p. Find a formula for the revenue $R(p)$ if the unit price is set at p dollars.

(**b**) (4 points) Suppose that the revenue (in dollars) for selling q laptops is given by $R(q) = 195 + 30q - q^2$. Find the number of laptops sold which will maximize the revenue.

(3). The graph of the function h is given below.



(**a**) (4 points) Use interval notation to write the intervals over which h is increasing.

(**b**) (4 points) Use interval notation to write the intervals over which h is decreasing.

(**c**) (4 points) Identify the location and value of any relative maximums of h.

(**d**) (2 points) Identify the location and value of any relative minimums of h.

(4). Use the following table of values for f and g to find the value of the indicated expressions (indicate if the given expression is undefined)

x	-2	-1	1	2	3	5
$f(x)$	7	2	3	6	-3	10
$g(x)$	4	-4	8	5	-5	3

(**a**) (2 points) $(f \circ g)(2) =$ ______

(**b**) (2 points) $(f \cdot g)(3) =$ ______

(**c**) (2 points) $(g \circ f)(2) =$ ______

(**d**) (2 points) $\left(\frac{g}{f}\right)(-1) =$ ______

(5). (7 points) Divide the following polynomials. *Note: synthetic division will not work.*

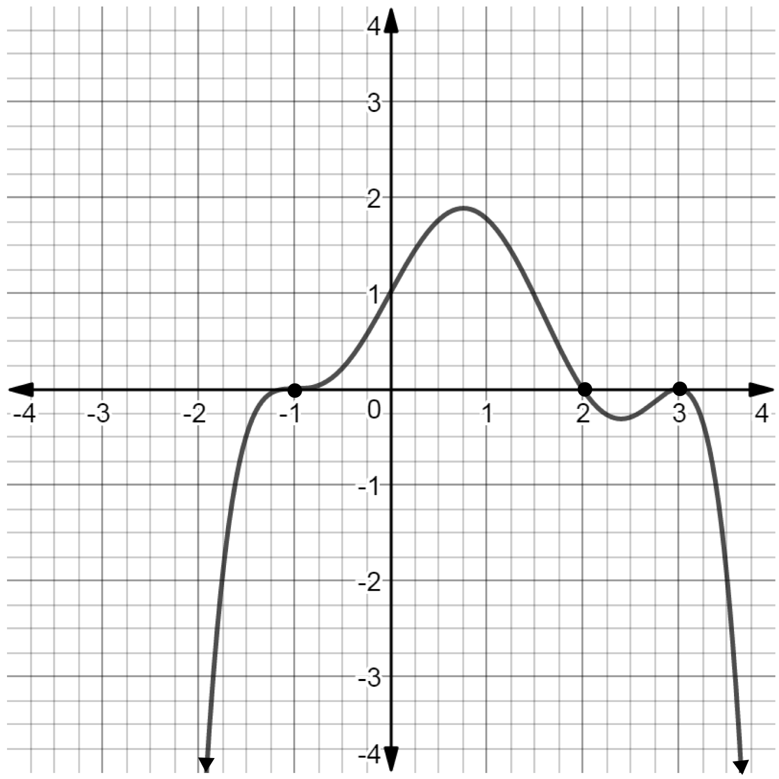
$$\frac{3x^3 - 4x^2 + 2x - 5}{x^2 + 2}$$

Quotient polynomial $= Q(x) =$ ____________________

Remainder polynomial $= R(x) =$ ____________________

(6). (9 points) A soccer ball is hit from the ground and lands 12 meters away from where it was hit. Furthermore, it reached a maximum height of 9 meters during its travel. Assuming that the path of the ball is a parabola (ignoring air resistance), find a quadratic function to model the height of the ball when it has traveled x meters horizontally.

(7). The graph of the polynomial g is given below



(**a**) (6 points) List the roots of g and circle the correct answer whether their multiplicities are odd or even. (note: not all spaces may be filled in)

root: $x =$ _______ multiplicity: ODD / EVEN

root: $x =$ _______ multiplicity: ODD / EVEN

root: $x =$ _______ multiplicity: ODD / EVEN

root: $x =$ _______ multiplicity: ODD / EVEN

(**b**) (1 point) Circle the correct answer: Is the leading coefficient of g positive or negative?

Leading coefficient: POSITIVE / NEGATIVE

(**c**) (1 point) Circle the correct answer: Is the degree of g odd or even?

Degree: ODD / EVEN

(8). Suppose that

$$P(x) = x^3 + 4x^2 - 7x - 10$$

(**a**) (5 points) Find a polynomial $Q(x)$ such that $(x-2)Q(x) = P(x)$ using polynomial division.

(**b**) (5 points) Find a polynomial $S(x)$ such that $(x+5)S(x) = P(x)$ using polynomial division.

(9). Given the rational function $r(x) = \dfrac{(x+1)^2}{(x+3)(x-4)^2}$,

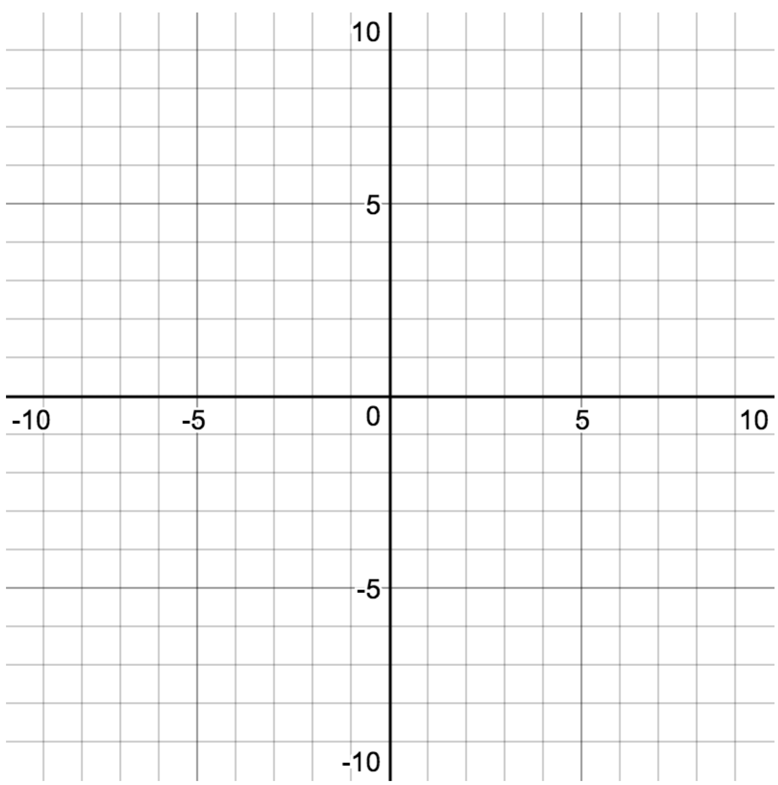
(**a**) (2 points) Find the y-intercept(s), state if there are none.

(**b**) (3 points) Find the x-intercept(s), state if there are none.

(**c**) (2 points) Find the equation of any vertical asymptotes.

(**d**) (3 points) Find the equation of any horizontal asymptotes.

(**e**) (8 points) Sketch a graph of r, making sure to plot and label all information from parts (a)-(d).



(10). The piecewise defined function $P(x)$ is given by:

$$P(x) = \begin{cases} -2 & \text{if } x < -4 \\ x^2 - 8 & \text{if } -4 \leq x < 2 \\ x - 5 & \text{if } x \geq 2 \end{cases}$$

(**a**) (4 points) Find the following:

(i). $P(-5) =$ ______ (ii). $P(-2) =$ ______ (iii). $P(2) =$ ______ (iv). $P(7) =$ ______

(**b**) (7 points) Plot and label your points from part (a) and then sketch the graph of $y = P(x)$.