Name (Print): _____

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Lecturer: _____

Rec. Instructor: _____

Rec. Time: _____

Math 1130
Spring 2019
Sample Final B
4/29/19

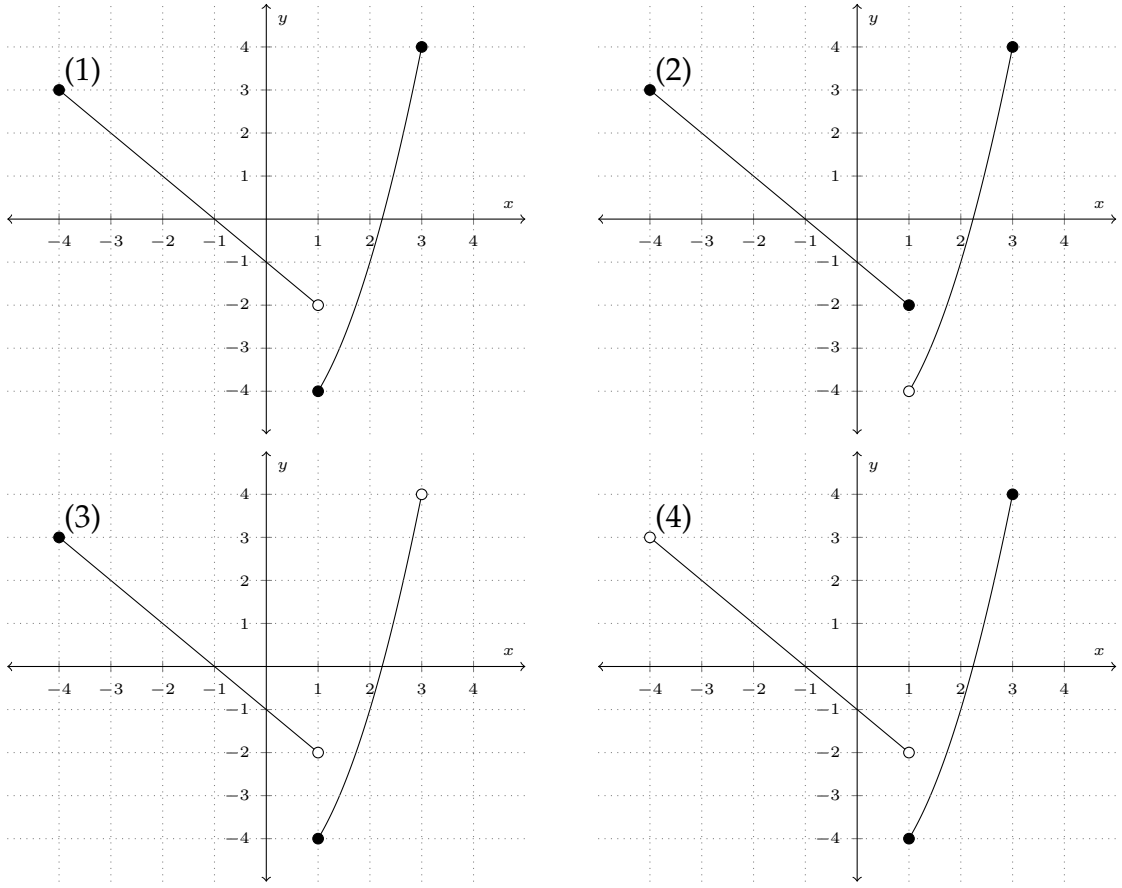
This exam contains 14 pages (including this cover page) and 12 problems. Check to see if any pages are missing. The exam is worth 200 points. The value of each question is listed below.

The following rules apply:

- You have **105 Minutes** to complete this exam.
- You may **not** use your books or notes on this exam.
- Please write clearly.
- **Partial Credit**: You are required to show your work on each problem of this exam. Incorrect answers with supporting work may receive partial credit. Any questions without supporting work will receive no credit. Partial credit might not be awarded on some questions.
- Calculators are permitted with the exception of calculators that have symbolic algebra or calculus capabilities. In particular, the following calculators (and their upgrades) are not permitted: TI-89, TI-92, TI-Nspire CX CAS, and HP-49. In addition, neither PDAs, laptops, nor cell phones are permitted.
- Unless otherwise specified, make sure your answers are in **exact form** (i.e. not a decimal approximation).
- Please write your answers in the boxes provided unless otherwise instructed.

Page:	2	3	4	5	6	7	8	9	10	11	12	Total
Points:	18	12	12	18	12	20	20	20	24	28	16	200
Score:												

1. The graphs shown here (labeled (1)-(4)) satisfy certain characteristics. Match the description given in each part with one of the graphs shown here. Graphs may be used more than once.



(a) (6 points) This graph represents a function with domain $(-4, 3]$.

The answer to part (a) is $\square$

(b) (6 points) This graph represents a function with range $[-4, 4)$.

The answer to part (b) is $\square$

(c) (6 points) This graph represents the piecewise function

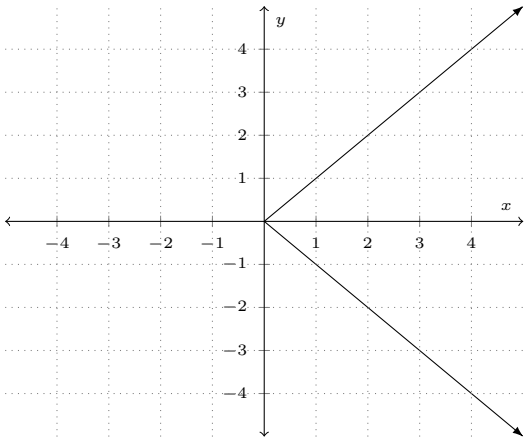
$$f(x) = \begin{cases} -x - 1 & \text{if } -4 \leq x < 1 \\ x^2 - 5 & \text{if } \quad 1 \leq x \leq 3 \end{cases}$$

The answer to part (c) is $\square$

2. Answer the following short questions. Fill in the blanks.

   (a) (6 points) If A is a 22×15 matrix and B is a 15×19 matrix, then the product AB is a _____×_____ matrix.

   (b) (6 points) You are given the curve below; is it the graph of a function (answer yes or no)?_____



3. (a) (6 points) The sequence below is arithmetic. Determine the missing term.

$$105 \quad , \quad 86 \quad , \quad 67 \quad , \quad \_\_\_\_\_ \quad , \quad 29 \quad ,$$

(b) (6 points) The sequence below is geometric. Determine the missing term.

$$3 \quad , \quad \_\_\_\_\_ \quad , \quad 147 \quad , \quad 1029$$

4. (a) (10 points) You are given the following supply and demand equations:

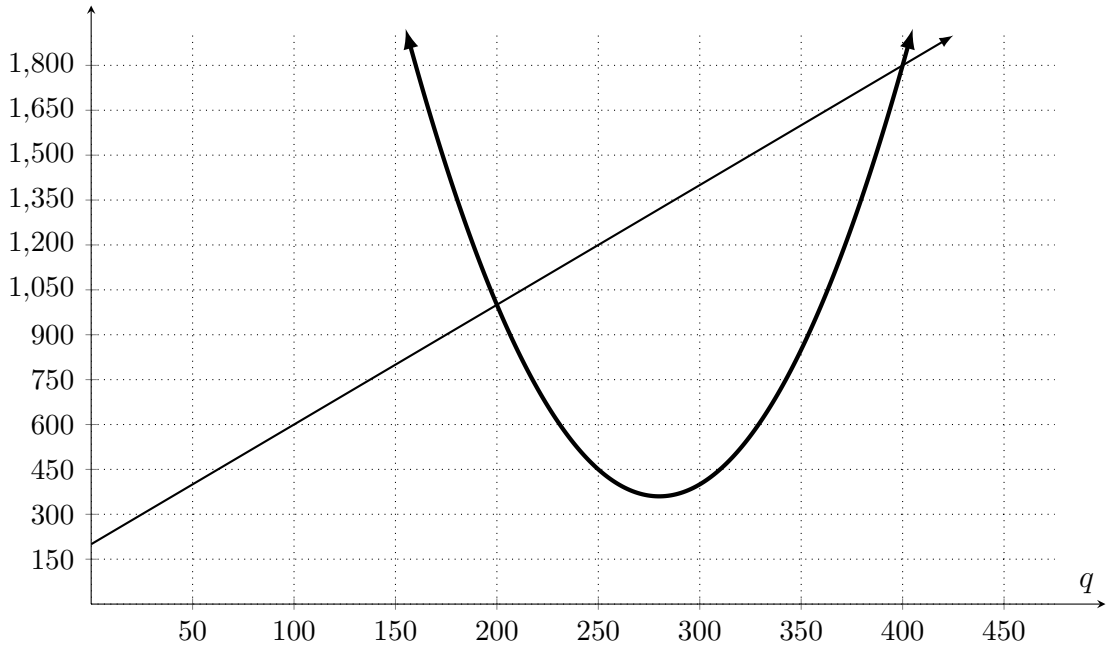
$$\begin{cases} S(q) &= 9q - 65 \\ D(q) &= -8q + 122 \end{cases}$$

Determine the equilibrium quantity, q.

$q =$ [ ]

(b) (8 points) The demand equation for burritos is given by $p = 53 - 6q$. Determine the revenue function, $R(q)$.

$R(q) =$ [ ]



5. The graph above represents the revenue (the dotted line) and cost (the solid line) functions for some company. The horizontal axis represents quantity of units sold, and the vertical axis represents dollars. Use the graph to answer the questions below.

   (a) (5 points) Which of the following best represents the profit when the quantity of units sold is 250?

   (i) 250 (ii) 500 (iii) 750 (iv) 1000

   (b) (5 points) What are the break even quantities?

   $q =$ ☐

   (c) (2 points) Estimate the value of q that gives the maximum profit.

   $q \approx$ ☐

6. (10 points) A company has taxable income of $\$775,000$. The federal tax is 32% of the portion left after the state tax has been paid. The state tax is 6% of the portion left after the federal tax has been paid. Let x denote the federal taxes and y denote the state taxes owed by the company. Set up a system of two equations that will solve for x and y. Do not solve for x and y!

7. (10 points) Solve the system of equations algebraically (no credit will be given if no work is provided). Give your solution(s) as ordered pairs.

$$\begin{cases} y = 2x^2 - 7 \\ \sqrt{y} = x + 3 \end{cases}$$

$(x, y) =$ _____

8. Solve for x in the following equations:

(a) (10 points)

$$\log_x(x^4 + 2x^2 - 9x + 10) = 4$$

$x =$ ☐

(b) (10 points)

$$\log(x - 3) + \log(x + 5) = 2\log x$$

$x =$ ☐

9. You are given the following matrix equation:

$$\begin{bmatrix} 5 & -3 \\ -6 & 2 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -3 \\ 14 \end{bmatrix}$$

(a) (10 points) Write the matrix equation as a system of two equations in the unknowns x and y in the space provided.

(b) (10 points) Solve the following system of three equations in three unknowns:

$$\begin{cases} 2x + 4y - 3z &= -23 \\ x - 2y &= 8 \\ -4y + 3z &= 27 \end{cases}$$

$x =$ $\quad$ $y =$ $\quad$ $z =$

10. Perform the indicated operations on the following matrices.

(a) (12 points) Let

$$A = \begin{bmatrix} 6 & 4 \\ -5 & 3 \end{bmatrix}$$

Determine the product AA^T

$$AA^T = \begin{bmatrix} \_\_\_\_\_ & \_\_\_\_\_ \\ \_\_\_\_\_ & \_\_\_\_\_ \end{bmatrix}$$

(b) (12 points) Use an augmented matrix, $[B|I]$, and elementary row operations to find the inverse of the following matrix:

$$B = \begin{bmatrix} 6 & -7 \\ -4 & 5 \end{bmatrix}$$

$$B^{-1} = \begin{bmatrix} \_\_\_\_\_ & \_\_\_\_\_ \\ \_\_\_\_\_ & \_\_\_\_\_ \end{bmatrix}$$

11. Answer the interest theory problems below. Give each answer to two decimal places.

(a) (14 points) $\$1872$ is deposited into a bank account today. The account earns 8.5% interest compounded continuously. Determine the amount in the bank account after 10 years.

amount= ____

(b) (14 points) You receive a loan of $\$19,582$ for a car. The interest rate is 8.4% (nominal) compounded monthly, and the loan will be paid off in five years by making monthly payments. The payments are all equal. Determine the payment, rounded to two decimal places.

payment= ____

12. (a) (10 points) Compute the value of the sum S. Round your answer to one decimal place if necessary.

$$S = \sum_{i=1}^{\infty} 48 \left(\frac{1}{4}\right)^{i-1}$$

$S =$ [ ]

(b) (6 points) Suppose that you are given that

$$\sum_{i=1}^{\infty} ar^{i-1} = 68.$$

In addition, you know that $a = 15$. Use this information and properties of sums to compute

$$S = \sum_{i=2}^{\infty} ar^{i-1}$$

$S =$ [ ]

Scrap work

Some Useful Formulas

$$S = P(1+r)^n$$

$$P = S(1+r)^{-n}$$

$$r_e = \left(1+\frac{r}{n}\right)^n - 1$$

$$S = Pe^{rt}$$

$$P = Se^{-rt}$$

$$r_e = e^r - 1$$

$$A = Ra_{\overline{n}|r} = R\frac{1-(1+r)^{-n}}{r}$$

$$R = \frac{A}{a_{\overline{n}|r}} = A\frac{r}{1-(1+r)^{-n}}$$

$$S = Rs_{\overline{n}|r} = R\frac{(1+r)^n - 1}{r}$$

$$\sum_{i=1}^{\infty} ar^{i-1} = \frac{a}{1-r}$$

$$\sum_{i=1}^{k} ar^{i-1} = \frac{a(1-r^k)}{1-r}$$

$$\text{Int}_k = R \cdot [1-(1+r)^{-n+k-1}]$$
$$\text{Prin}_k = R \cdot (1+r)^{-n+k-1}$$