Name (Print): ____________________

Username.#: ____________________

Lecturer: ____________________

Rec. Instructor: ____________________

Rec. Time: ____________________

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

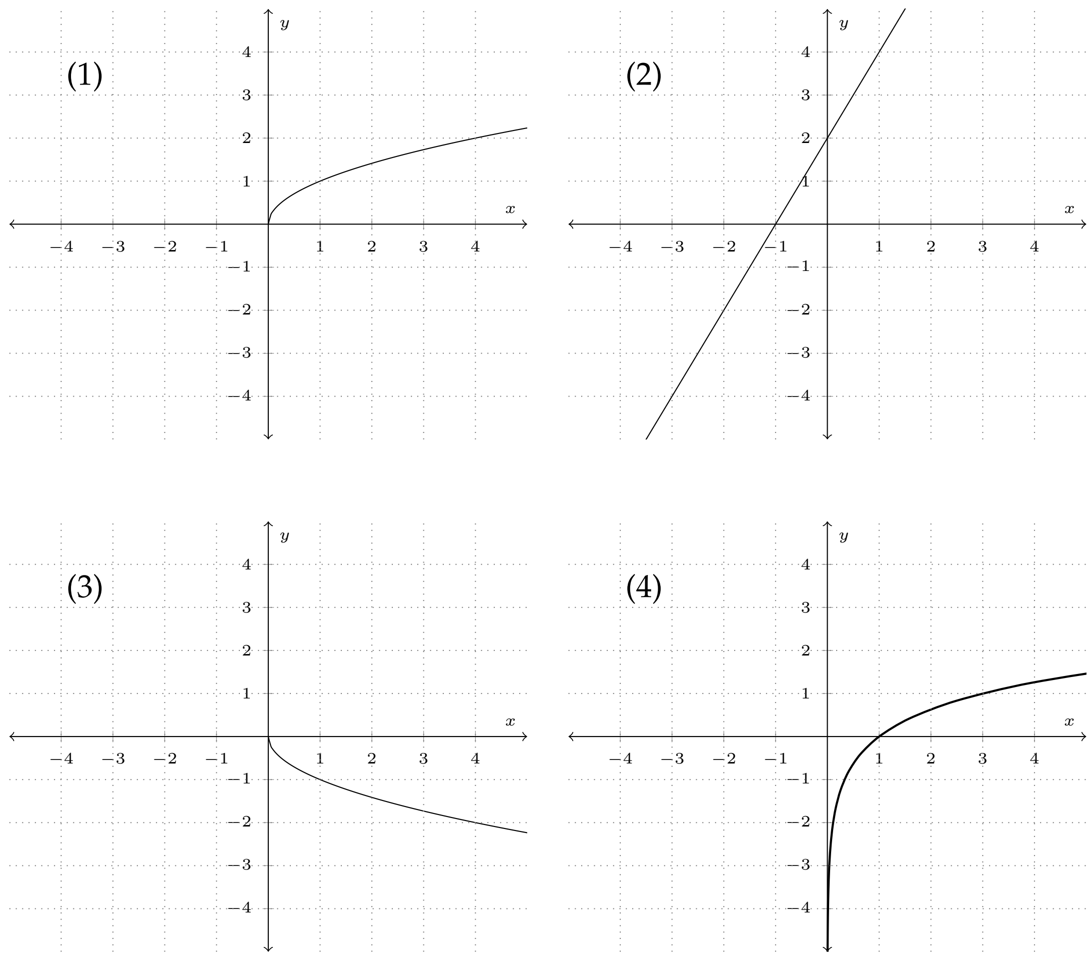
This exam contains 14 pages (including this cover page) and 10 problems. Check to see if any pages are missing. The exam is worth 200 points. The value of each question is listed below.

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, 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.
- A random sample of graded exams will be copied before being returned.

Question	Points	Score
1	18	
2	18	
3	18	
4	20	
5	24	
6	20	
7	22	
8	18	
9	20	
10	22	
Total:	200	

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 the inverse of the function $f(x) = x^2$ with domain $[0, \infty)$.

The answer to part (a) is $\boxed{}$

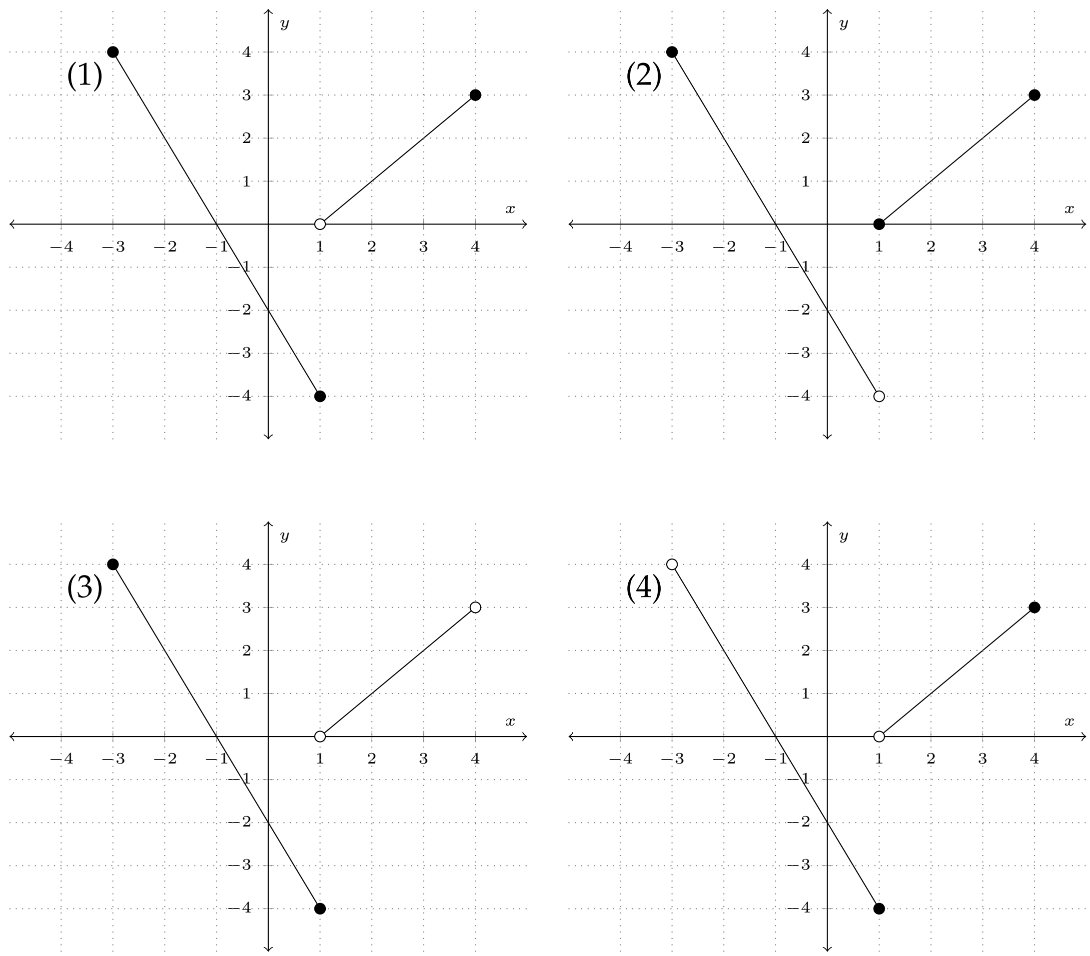
(b) (6 points) This graph represents a line with slope 2.

The answer to part (b) is $\boxed{}$

(c) (6 points) This graph represents a logarithm with base 3.

The answer to part (c) is $\boxed{}$

2. 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 $[-3, 4)$.

The answer to part (a) is

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

The answer to part (b) is

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

$$f(x) = \begin{cases} -2x - 2 & \text{if } \; -3 \le x \le 1 \\ x - 1 & \text{if } \; 1 < x \le 3 \end{cases}$$

The answer to part (c) is

3. Answer the following short questions. Fill in blanks when available.

(a) (6 points) If A is a 4×3 matrix and B is $\begin{pmatrix} 2 & -4 & 1 \\ -4 & 1 & 0 \\ 4 & 3 & -1 \end{pmatrix}$, then the product AB is a _____×_____ matrix.

(b) (6 points) Let f be a function with domain $(1, 17]$. In addition, f is one-to-one. Then f has an inverse function with range _____, _____. (Make sure you include parentheses/brackets in the appropriate space!)

(c) (6 points) What test determines if a curve is actually the graph of a function?

4. You are given the following matrix equation:

$$\begin{pmatrix} 1 & 3 & -1 \\ 2 & -1 & 1 \\ 0 & -2 & 0 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} -5 \\ -6 \\ -2 \end{pmatrix}$$

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

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

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

$x = \boxed{}$ $y = \boxed{}$ $z = \boxed{}$

5. Solve the following equations/systems of equations algebraically (no credit will be given if no work is provided):

   (a) (12 points) Determine all solutions (x, y). Separate your ordered pairs with a comma.

$$\begin{cases} y = 2x^2 + 3x \\ y = x^2 + 5x + 3 \end{cases}$$

$(x, y) =$ $\boxed{}$

   (b) (12 points) Determine all solutions to the equation below. Separate multiple solutions with a comma.

$$x + \sqrt{x+2} = 4$$

$x =$ $\boxed{}$

6. Solve for x in the following equations:

   (a) (10 points)

$$\log_x(3x+4) = 2$$

$x = \boxed{}$

   (b) (10 points)

$$\log(x-1) + \log(x+2) = 2\log x$$

$x = \boxed{}$

7. (a) (12 points) You are given that 1.4 million burgers are demanded at a price of $\$5.38$. You are also given that 1.2 million burgers are demanded at a price of $\$5.78$. The demand equation is assumed to be of the form $p = mq + b$, where q is the quantity of burgers (in millions) and p represents dollars. Determine the demand equation.

$p = \boxed{}$

(b) (10 points) You are given the following supply and demand equations:

$$\begin{cases} S(q) &= 2q - 17 \\ D(q) &= -2q^2 + 3q + 4 \end{cases}$$

Determine the equilibrium quantity, q.

$q = \boxed{}$

8. (a) (6 points) You are given that the demand equation for burritos is given by $p = 15 - 3q$. Determine the revenue function, $R(q)$.

$R(q) = \boxed{}$

(b) (12 points) Given that the profit equation for churros is $P(q) = -3q^2 + 5q + 3$, determine the maximum profit on churros. Round your answer to two decimal places.

Max Profit= $\boxed{}$

9. Perform the indicated operations on the following matrices.

(a) (10 points) Multiply the following matrices. Write your result in the space provided.

$$\begin{pmatrix} 1 & 3 \\ 2 & -1 \end{pmatrix} \begin{pmatrix} -2 & 2 \\ 1 & 4 \end{pmatrix} = \begin{pmatrix} \underline{\hspace{2em}} & \underline{\hspace{2em}} \\ \underline{\hspace{2em}} & \underline{\hspace{2em}} \end{pmatrix}$$

(b) (10 points) Use an augmented matrix, $[A|I]$, and elementary row operations to find the inverse of the following matrix:

$$A = \begin{pmatrix} 3 & 1 \\ 5 & 2 \end{pmatrix}$$

$$A^{-1} = \begin{pmatrix} \underline{\hspace{2em}} & \underline{\hspace{2em}} \\ \underline{\hspace{2em}} & \underline{\hspace{2em}} \end{pmatrix}$$

10. Answer the interest theory problems below. Make sure to write down the formula(s) you use for each part. Give each answer to the nearest penny.

    (a) (10 points) $\$125$ is deposited into a bank account that earns 7.3% interest compounded continuously. In how many years will the account reach \$300? Round your answer to two decimal places.

    Answer: $\boxed{}$

    (b) (12 points) You deposit X at the end of each month for 8 years. The interest rate is 5.4% (nominal) compounded monthly. After the last payment, the account has \$100,000. Determine X, rounded to two decimal places.

    $X = \boxed{}$

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Some Useful Formulas

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

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

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

$$S = Pe^{rt}$$

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

$$r_e = e^r - 1$$

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

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

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

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

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

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

Scrap work