Math 101, Final Exam

December 16, 2015

Name and section: _____ Student ID: _____

Indicate your section/instructor.

Question	Points	Score
1	10	
2	15	
3	15	
4	15	
5	20	
6	15	
7	15	
8	15	
9	15	
10	15	
Total:	150	

☐ Section 002   Kelly   ☐ Section 003   Galvin

☐ Section 005   Conner   ☐ Section 006   Williams

☐ Section 009   Dyrud   ☐ Section 010   McMorris

☐ Section 013   Beemer   ☐ Section 014   Miller

☐ Section 017   Gheibi   ☐ Section 020   Hass

☐ Section 023   Bukoski   ☐ Section 027   Ismert

☐ Section 101   Schwaninger   ☐ Section 171   Bills

Answer the questions in the spaces provided on the question sheets. If you run out of room for an answer, continue on the back of the page. Show an appropriate amount of work (including appropriate explanation) for each problem, so that graders can see not only your answer but also how you obtained it. Include units in your answer when possible. You may receive 0 points for a problem where you show no work.


Instructions:

1. Do not open this exam until you are told to do so.

2. No books or notes may be used on the exam.

3. Credit or partial credit will be given only when the appropriate explanation and/or algebra is shown.

4. Make sure your answer is clearly marked.

5. Read and follow directions carefully.

6. This exam has 10 questions, for a total of 150 points. There are 10 pages. Make sure you have them all.

7. You will have 120 minutes to complete the exam.

8. All Cell Phones must be turned off during the exam.

9. Do not separate the pages of this exam. If they do become separated, write your name on every page and point this out to your instructor when you hand in the exam.

10. You may only use an *approved* calculator on the exam. If you have a problem with your calculator, raise your hand.

11. If you use graphs or tables to find an answer, be sure to include an explanation and sketch of the graph, and to write out the entries of the table that you use.

1. [10 points] Sam earns a base salary plus commission. Sam earns a daily salary of $125 plus $1.00 for each $100 dollars worth of product he sells.

   (a) Write an equation $f(x)$ representing the amount of money in dollars Sam earns in one day in which he sells x dollars worth of product.

   (b) Evaluate and interpret $f(2500)$. *Be sure to write your interpretation in complete sentences including units.*

2. [15 points] Give a formula for the polynomial of least degree pictured here. You do not need to simplify.
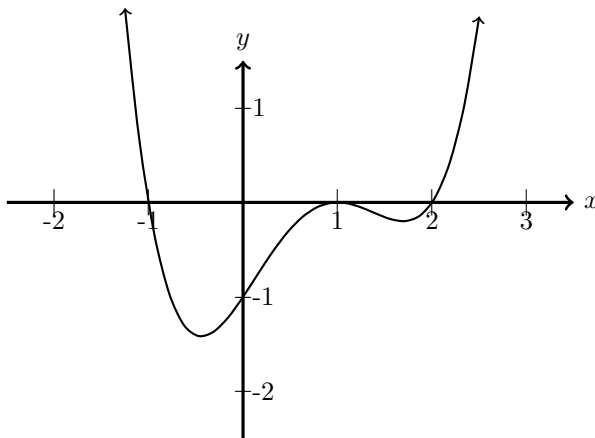
3. [15 points] For the polynomials below, state the degree, the leading term, and describe the long-run behavior.

(a) $y = 3x^3 + 2x^2 - 3x + 4$

Degree: _____

Leading term: _____

Long-run behavior:

(b) $y = 3 - x^4 + 2x^3$

Degree: _____

Leading term: _____

Long-run behavior:
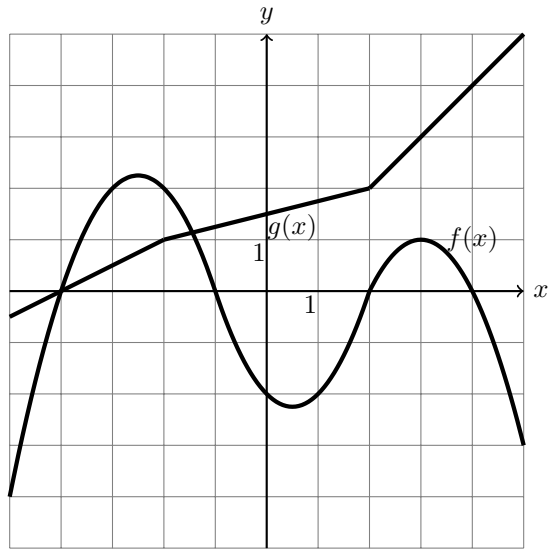
(c) $y = x^2(2x - 1)(3 + x)$

Degree: _____

Leading term: _____

Long-run behavior:

4. [15 points] Using the graph below, evaluate the following quantities.

(a) $g(f(-2))$

(b) $f(g(3))$

(c) $f(2)g(2)$

(d) $f(g^{-1}(1))$

5. [20 points] Under a special promotion, Baskin Robbins charged $2.00 for any bowl of ice cream up to 8 ounces and $0.40 for each additional ounce beyond the 8 ounces.

(a) Fill in the following table showing the cost for x ounces of ice cream.

Ounces:	1	5	10	12	14
Cost (in dollars):					

(b) What is the cost for 11 ounces of ice cream?

(c) Complete the piecewise defined function $C(x)$ the cost, in dollars, of x ounces of ice-cream.

$$C(x) = \begin{cases} \rule{3cm}{0.4pt}, & \text{for } 0 < x \leq \square \\ \rule{3cm}{0.4pt}, & \text{for } \square < x \end{cases}$$

(d) If your bill was $4.60, how many ounces of ice cream did you purchase? *Write your answer in complete sentences, being sure to include units.*

6. [15 points] Let $P = f(t) = 120(1.03)^t$ be the number of bacteria in a certain sample t minutes after the start of an experiment.

(a) Evaluate and interpret $f(12)$. *Be sure to write your interpretation in complete sentences, being sure to include units.*

(b) Find a formula for $f^{-1}(P)$ in terms of P.

(c) Evaluate and interpret $f^{-1}(240)$. Round your answer to the nearest hundredth. *Be sure to write your interpretation in complete sentences, being sure to include units.*

7. [15 points] An ecologist measured the number of dandelions in two different parks beginning in the year 2005. The following table summarizes his findings.

Years since 2005	0	1	2	3	4
Thousands of dandelions in Meadowland Park	2	3.11	4.22	5.33	6.44
Thousands of dandelions in Scarlet Park	3	3.6	4.32	5.18	6.22
Thousands of dandelions in Union Park	4	4.5	4.75	5	5.5

(a) For Meadowland Park, determine if dandelion growth is best modeled with a linear function, exponential function, or neither, and (if it is linear or exponential) find a formula for the function. *Be sure to justify your choice using complete sentences.*

(b) For Scarlet Park, determine if dandelion growth is best modeled with a linear function, exponential function, or neither, and (if it is linear or exponential) find a formula for the function. *Be sure to justify your choice using complete sentences.*

(c) For Union Park, determine if dandelion growth is best modeled with a linear function, exponential function, or neither, and (if it is linear or exponential) find a formula for the function. *Be sure to justify your choice using complete sentences.*

(d) If the trend continued, then how many dandelions were present in Scarlet Park in 2012? *Write your final answer in a single complete sentence, being sure to include units.*

8. [15 points] Let P be the point $(5,3)$ and let l be the line given by the graph of the equation $y = \frac{1}{2}x + 4$.

(a) Find the equation of a line containing P and parallel to l.

(b) Find the equation of a line containing P and perpendicular to l.

(c) Graph and label the two lines whose equations you found in parts (a) and (b) (clearly label the y-intercepts).
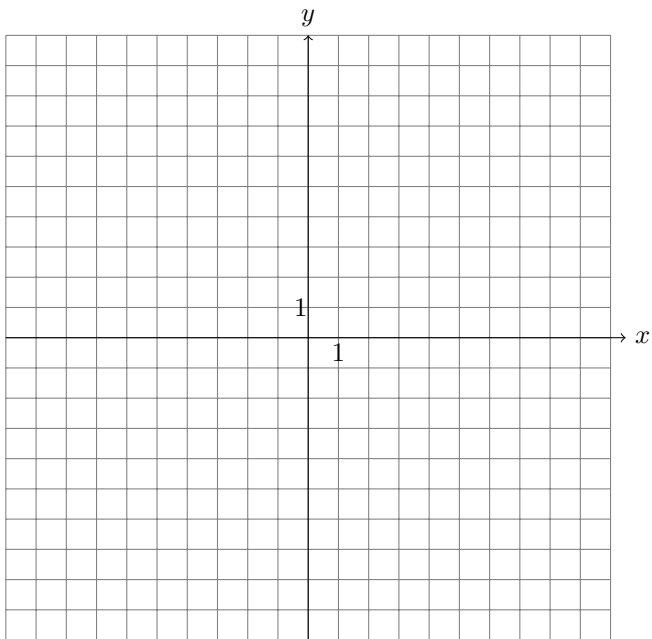
9. [15 points] The time t, in hours, of harvesting q kilograms of a certain bean (including set-up time) is given by $t = f(q) = 2 + 1.3q$. The cost C, in dollars, of renting harvesting equipment for t hours is given by

$$C = g(t) = \begin{cases} 100t & t \le 5 \\ 500 & 5 \le t \le 24 \end{cases}.$$

(a) Evaluate and interpret $f(10)$. *Be sure to write your interpretation in complete sentences including units.*

(b) Evaluate and interpret $g(12)$. *Be sure to write your interpretation in complete sentences including units.*

(c) Evaluate and interpret $g(f(2))$. *Be sure to write your interpretation in complete sentences including units.*

10. [15 points] Consider the functions

$$f(x) = \frac{x-3}{(x-2)(x-3)} \qquad \text{and} \qquad g(x) = \frac{(x-4)(x+1)}{(x+2)(x-4)}$$

(a) For each of the above functions, determine the long-run behavior, zeros, vertical asymptotes, and holes. If the function does not have any, write "none."

$f(x)$

- Long-run behavior _____

  _____

- Zeros _____

- Vertical asymptotes _____

- Holes _____

$g(x)$

- Long-run behavior _____

  _____

- Zeros _____

- Vertical asymptotes _____

- Holes _____

(b) Determine which of the above functions matches the given graph.