

MATH 122: Exam 1
Fall — 2024
09/10/2024
75 Minutes

Name: _____

Write your name on the appropriate line on the exam cover sheet. This exam contains 8 pages (including this cover page) and 7 questions. Check that you have every page of the exam. Answer the questions in the spaces provided on the question sheets. Be sure to answer every part of each question and show all your work. If you run out of room for an answer, continue on the back of the page — being sure to indicate the problem number.

Question	Points	Score
1	10	
2	15	
3	15	
4	15	
5	15	
6	15	
7	15	
Total:	100	

1. Let $f(x) = 2x - 5$ and $g(x) = x^2 + 2x - 3$. Find and simplify the following:

(a) (2 points) $(fg)(0)$

(b) (2 points) $(g - f)(2)$

(c) (3 points) $(g \circ f)(x)$

(d) (3 points) $g(2 + h) - g(2)$

2. For each of the following functions, find functions $u(x), v(x)$ such that $f(x) = (v \circ u)(x)$.

(a) (5 points) $f(x) = (e^x + 5)^{10}$

(b) (5 points) $f(x) = 6 \ln(1 - x^2)$

(c) (5 points) $f(x) = \frac{1}{5x - 6}$

3. Chlorofluorocarbons (CFCs) were chemicals used in the manufacture of aerosol sprays and refrigerants that were harmful to the ozone layer. The 1987 Montreal Protocol helped reduce the use of such substances. Let $C(t)$ denote the parts per trillion (ppt) of CFCs in the atmosphere t years after 1987.

(a) (3 points) Interpret $C(26) = 233$ in words.

(b) (3 points) What would the y -intercept of $C(t)$ represent?

(c) (3 points) What would the x -intercept of $C(t)$ represent?

(d) (3 points) If $C(t)$ were linear, what would the slope of $C(t)$ represent?

(e) (3 points) Write a mathematical expression representing the statement, “The ppt of CFCs in the atmosphere in 2015 was 10 ppt less than what it was in 2010.”

4. Azalea Pharmacy sells body milks, which is milk for your body. The store pays approximately \$1,400 per month in rent, utilities, supplies, etc. They purchase the body milk from local suppliers for \$25 per bottle and resell these bottles under their brand for \$58 per bottle.

(a) (5 points) Find $R(q)$, the revenue from selling q bottles of this product.

(b) (5 points) Find $C(q)$, the cost function from selling q bottles of this product.

(c) (5 points) What is the minimal number of bottles that the store must sell to turn a profit?

5. Robbin and Draskin are friends that own an ice cream truck called 'Don't Stop Be-Freeze-in.' Each day, they drive the truck around the boroughs of Conelumbia trying to satisfy customers in the summer heat. They find that their cost function, $C(q)$, for selling q novelty cones is given by $C(q) = 0.87q + 940$.

(a) (5 points) What are the fixed costs for their product?

(b) (5 points) What is the marginal cost for their product?

(c) (5 points) How much does it cost them to sell 200 novelty cones?

6. Patrick Rose is reading Frank Herbert's six novel *Dune* series when he isn't working at his store. The series is a daunting 2,550 pages—approximately. Looking at how many pages he has read thus far, he plans out a daily reading schedule that can be given by the model $P(d) = 32d + 484$, where d is the number of days from today.

(a) (5 points) Find and interpret the y -intercept of $P(d)$.

(b) (5 points) Find and interpret the slope of $P(d)$.

(c) (5 points) How long until Patrick has read the entire series?

7. You are saving up to buy the box set of your favorite show—*Schmidt's River*. You deposit \$30 into an account that earns 3.5% annual interest, compounded continuously.

(a) (6 points) Find a function, $M(t)$, that gives the amount of money in the account t years from now.

(b) (6 points) If the box set costs \$90, how long until you have saved up enough money?

(c) (3 points) What is the annual percent growth rate of the money in the account?