



Department of Mathematics and Statistics

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Math 117 - Spring 2022 - Common Final Exam, version A

Print name: _____

Section number: _____ **Instructor's name:** _____

Directions:

- This exam has 12 questions. Please check that your exam is complete, but otherwise keep this page closed until the start of the exam is called.
- Fill in your name, instructor's name, and section above.
- It will be graded out of 100 points.
- Show your work. Answers (even correct ones) without the corresponding work will receive no credit.
- You may use a calculator that does not have access to the internet. The use of any notes or electronic devices other than a calculator is prohibited.

Good luck!

Question:	1	2	3	4	5	6	7
Points:	10	6	10	9	6	6	6
Score:							
Question:	8	9	10	11	12		Total
Points:	10	12	9	6	10		100
Score:							

1. (10 points) Fred is trying to cut down on the number of cans of Pepsi he drinks a week. In the first week, he drinks 39 cans of Pepsi. In week 2, he drinks 37 cans of Pepsi. Fred will continue cutting down on his Pepsi intake at this linear rate until he reaches 3 cans per week.

(a) If t is the week, find a formula for y , the number of cans Fred drinks in week t , where $1 \leq t \leq 18$.

(b) Compute $f(12)$ and explain the meaning of your answers in the context of this situation. *Your final answer should be a complete sentence.*

(c) Fred drinks 5 cans of Pepsi this week. What week is this?

2. (6 points) Suppose that $P = f(x)$ is the profit (in dollars) when a theater company sells x tickets for a show.

(a) If you were to graph P as a function of x , which variable would appear on the horizontal axis?

(b) In a sentence, explain the practical meaning of $f(30) = 140$.

(c) State the units of the rate of change $\frac{\Delta P}{\Delta x}$.

3. (10 points) Consider the function $f(x)$ below:

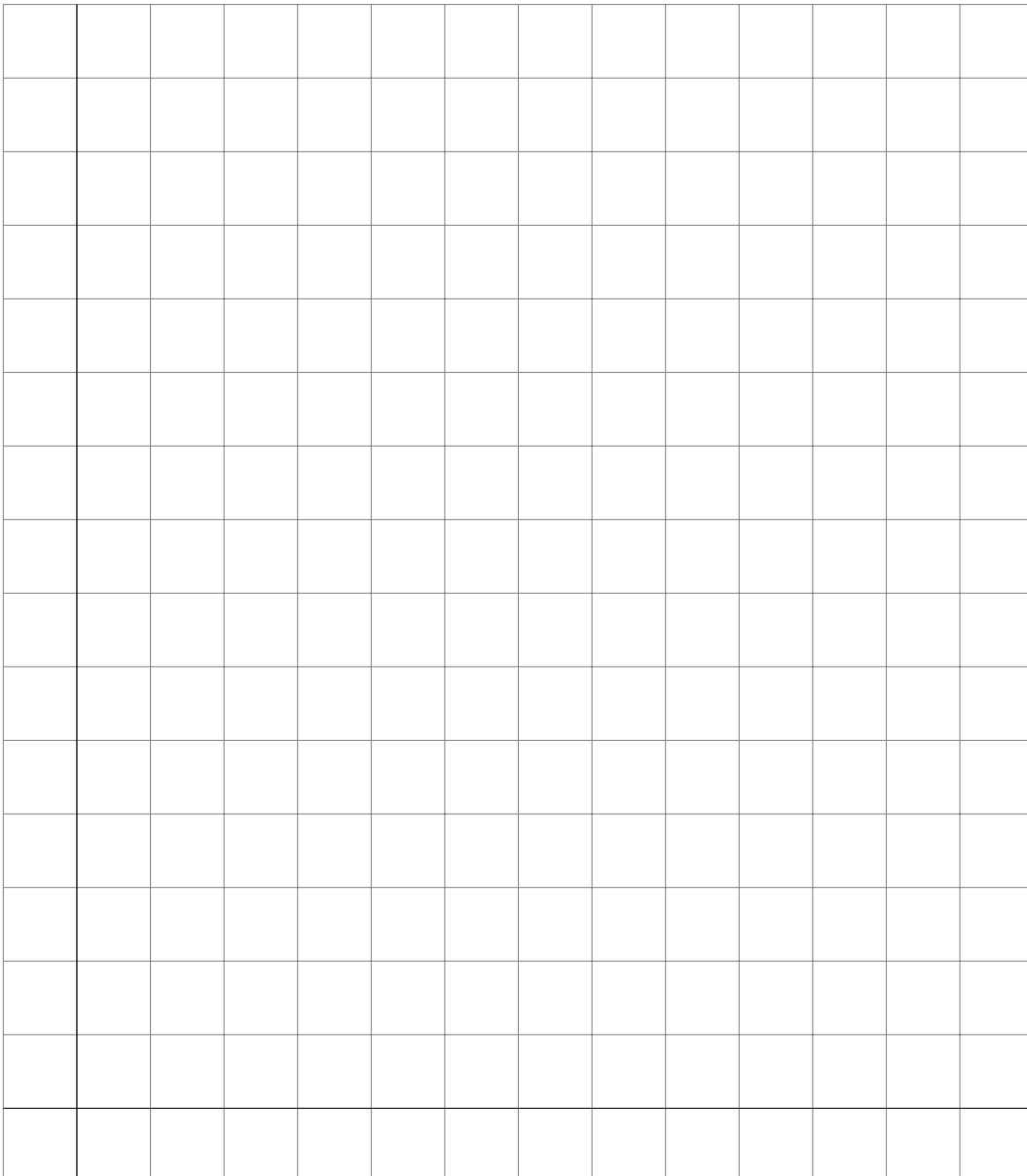
$$f(x) = \begin{cases} 2x & 0 \leq x < 4 \\ x + 3 & 4 \leq x < 8 \\ 0.5x + 8 & 8 \leq x < 12 \end{cases}$$

(a) Evaluate $f(3)$.

(b) Evaluate $f(4)$.

(c) What is the domain of $f(x)$?

(d) Graph $f(x)$ below. Be sure to include a scale on your graph!



Exam continues...

4. (9 points) A car approaches a red light, slows down, and ultimately comes to a stop. The car's distance d from the stop light t seconds after the brakes are first applied is given below.

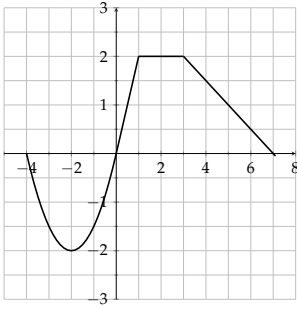
t	0	5	10	15	20
distance, d (feet)	180	90	45	20	0

- (a) In a complete sentence explain the meaning of the quantity $d^{-1}(100)$.
- (b) Does d appear to be an increasing or decreasing function? *Explain your answer in a sentence which references rates of change of d .*
- (c) Does d appear to be a concave up or concave down function? *Explain your answer in a sentence which references rates of change of d .*
5. (6 points) A ball is thrown straight up into the air. The height of the ball above the ground is given by the function $f(t) = -16t^2 + 63t + 4$, where t is the time in seconds after the ball has been thrown and $f(t)$ is the height of the ball in feet. Use the quadratic formula to find the time the ball hits the ground.

6. (6 points) Find the vertex and axis of symmetry of the graph of $f(x) = x^2 + 8x - 3$. You must show some algebra work to support your answer; a graph alone is not sufficient.

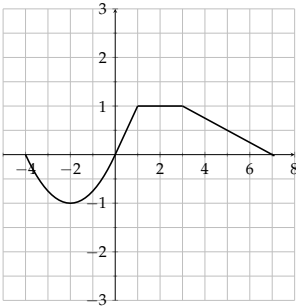
7. (6 points) Find a formula for the quadratic function $f(x)$ with a y -intercept of $(0,6)$ and x -intercepts of $(-1,0)$ and $(2,0)$.

8. (10 points) Consider the graph of the function $f(x)$ below. **The entire function is shown.**

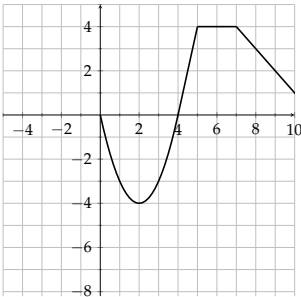


(a) Find the domain and range of $f(x)$.

(b) The graph below of $g(x)$ is a transformation of $f(x)$. Find the value for a such that $g(x) = a \cdot f(x)$.



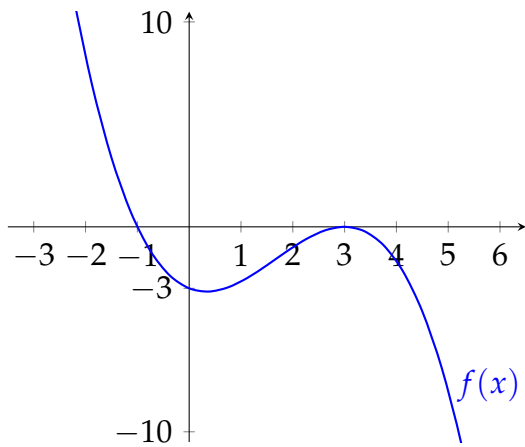
(c) The graph below of $j(x)$ is a transformation of $f(x)$. Find values for a, h, k such that $j(x) = a \cdot f(x - h) + k$.



9. (12 points) The graph of $y = f(x)$ passes through the points $(2, 32)$ and $(4, 512)$.
- (a) Find an expression for $f(x)$ if f is a linear function of the form $f(x) = mx + b$.
- (b) Find an expression for $f(x)$ if f is a power function of the form $f(x) = k \cdot x^p$.
10. (9 points) The time required to build a house is **inversely proportional** to the number of construction workers. Let $T(w)$ be the time, in days, for w workers to build a house.
- (a) Write a formula for the time, $T(w)$, in terms of w . Your answer should include the constant of proportionality, k .
- (b) It takes a crew of 19 workers 120 days to complete a house. Find k and rewrite the formula for $T(w)$ using it.
- (c) How many days does a crew of 24 workers need to complete a house?

Exam continues...

11. (6 points) Find an expression of minimum degree for the polynomial graphed below.



12. (10 points) Let $f(x) = \frac{(x-2)(x+4)(x-7)}{(x-5)(3x+14)(x-7)}$.

(a) Find the x -coordinates of the holes (if any) in the graph $y = f(x)$.

(b) Find the equation for each vertical asymptote, if any.

(c) Find the equation for each horizontal asymptote, if any.

(d) Find the x -intercepts, if any.

(e) Find the y -intercept, if any.