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Math 117 - Fall 2025 - Common Final Exam

Print name: Key

Section number: _____ Instructor's name: _____

Directions:

- Do not open your exam until you are instructed to do so by your instructor.
- Fill in your name, your instructor's name, and section number. If you don't know your section number, write the day and time that your class normally meets (example: MWF 8:15-9:05).
- This exam has 13 questions. Once the exam has begun, please check to make sure that your exam is complete.
- It will be graded out of 100 points.
- Show your work. Answers (even correct ones) without the corresponding work will receive no credit.
- A formula sheet has been provided with this exam. You may not refer to any other notes during the exam.
- You may use a calculator which does not allow internet access. The use of any notes or electronic devices other than a calculator is prohibited. Please remove any earbuds/headphones that you are wearing.
- Unless otherwise stated, round any constants to two decimal places if necessary.

Good luck!

Question:	1	2	3	4	5	6	7
Points:	5	9	16	6	8	6	9
Score:							
Question:	8	9	10	11	12	13	Total
Points:	6	10	15	4	4	2	100
Score:							

1. (5 points) Consider the function $f(x) = 2x^2 + 10x - 48$. Find the zeros of $f(x)$.

$$x = -8, 3$$

2. (9 points) Consider the function $g(x) = 4x^2 - 24x + 41$

~~3~~ (a) Is $g(x)$ concave up, concave down, or neither?

2 CCU, ~~as~~ as $a = 4 > 0$.

4
5 (b) Write $g(x)$ in vertex form.

$$h = \frac{-(-24)}{2(4)} = \frac{24}{8} = 3$$

$$k = g(3) = 4(3)^2 - 24(3) + 41 \\ = 36 - 72 + 41 = 5$$

$$g(x) = 4(x-3)^2 + 5$$

2 (c) What is the vertex of $g(x)$?

$$(3, 5)$$

3. (16 points) For each part of this problem, circle **all** of the expressions which could be formulas for the function described. There could be more than one answer for each part.

(a) The function $f(x)$ has a domain of all real numbers

1. $3x + 5$

2. $4x^2$

3. $5x^4 + 2x^3 - 5$

4. $-8x^5 - 4x^3 + 2x - 9$

5. $\sqrt{2x - 4}$

6. $\frac{3}{x - 5}$

7. None of these

1 - 4

(b) The function $g(x)$ has a range of all real numbers

1. $3x + 5$

2. $4x^2$

3. $5x^4 + 2x^3 - 5$

4. $-8x^5 - 4x^3 + 2x - 9$

5. $\sqrt{2x - 4}$

6. $\frac{3}{x - 5}$

7. None of these

1 + 4

(c) The function $h(x)$ has at least one vertical asymptote

1. $3x + 5$

2. $4x^2$

3. $5x^4 + 2x^3 - 5$

4. $-8x^5 - 4x^3 + 2x - 9$

5. $\frac{3}{x - 5}$

6. $\frac{x^2 + x - 20}{x^2 - 17x + 70}$

7. None of these

5 + 6

(d) The function $j(x)$ satisfies $\lim_{x \rightarrow \infty} j(x) = \infty$

1. $3x + 5$

2. $4x^2$

3. $5x^4 + 2x^3 - 5$

4. $-8x^5 - 4x^3 + 2x - 9$

5. $\sqrt{2x - 4}$

6. $\frac{3}{x - 5}$

7. None of these

1, 2, 3, 5

4. (6 points) The point $(3, -5)$ is on the graph of $f(x)$. What point must be on the graph of...

(a) $g(x) = f(x - 2) + 4$

$$(5, -1)$$

(b) $j(x) = 3f\left(\frac{1}{2}x\right)$

$$(6, -15)$$

5. (8 points) The tuition for Fred University is dependent on the number of credit hours a student is taking in a given semester. If a student is taking less than 12 credit hours, the student must pay \$800 per credit hour along with an additional fee of \$5000. If a student is taking 12 or more credit hours, they must pay 600 per credit hour with along with an additional fee of \$4000. The university will not allow any student to take more than 24 credit hours in a semester, and a student must take at least one credit hour.

(a) Find a piece-wise formula for the tuition, T , for a student taking C credit hours.

$$T = \begin{cases} 800C + 5000 & 1 \leq C < 12 \\ 600C + 4000 & 12 \leq C \leq 24 \end{cases}$$

(b) What is the domain of this function?

$$1 \leq C \leq 24$$

(6 points) The profits of a new company are directly proportional to the cube root of the amount of money that it spends on advertising. The profit of the company will be \$300 if they spend \$1000 on advertising.

(a) Write a formula for the profit, P , as a function of the amount spent on advertising, A .

$$P = 30 \cdot \sqrt[3]{A}$$

(b) Find the profit if \$125,000 is spent on advertising.

$$\$1500$$

7. (9 points) Let $f(x) = 8x - 2$, $g(x) = -4x + 3$ and $h(x) = x^2 - 5$. Find the following, and simplify your answers completely:

(a) $g(f(5))$

$$-149$$

(b) $f(h(x))$

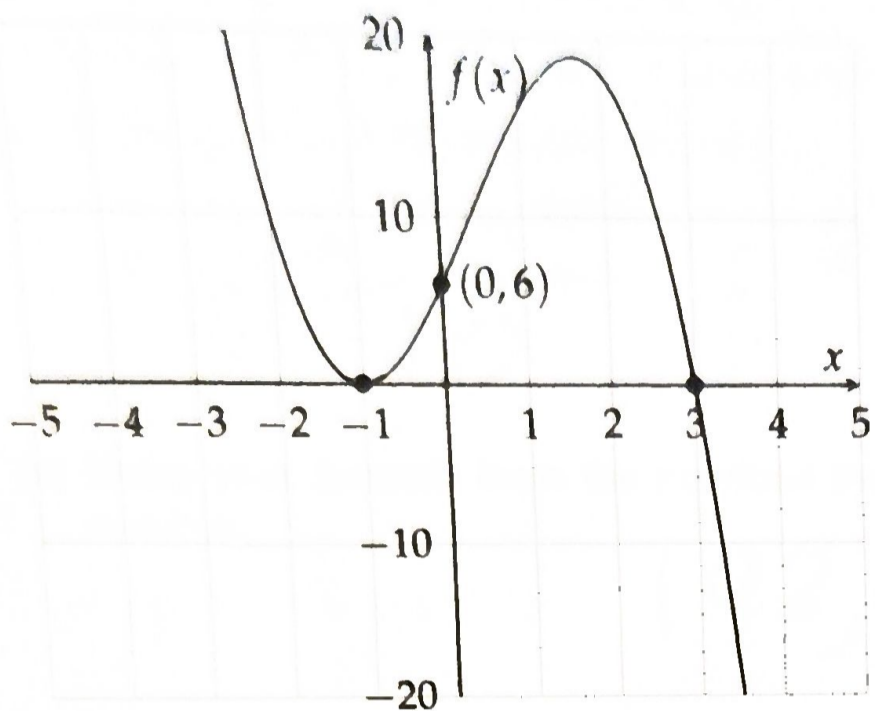
~~$8(x^2 - 5) - 2$~~

$$8(x^2 - 5) - 2$$
$$8x^2 - 42$$

(c) $f^{-1}(x)$

$$\frac{x + 2}{8}$$

(6 points) Find a possible formula for the polynomial function shown below.



$$-2(x+1)^2(x-3)$$

9. (10 points) Consider the function $k(x) = \frac{8(x-4)(x+5)(x+1)}{(x+7)(x-4)(x-3)}$

(a) Find the zeroes of $k(x)$.

$$x = -5$$

$$x = -1$$

(b) Find all vertical asymptotes.

$$x = -7, x = 3$$

(c) Find all hole(s) of $k(x)$.

$$x = 4$$

(d) Find the horizontal asymptote of $k(x)$.

$$y = 8$$

(0, 30000) (10, 300000)

10. (15 points) The CFO of a business is modeling the yearly profits of his business. He found that the yearly profit, P , in dollars, was a linear function of the number of years, t , since the business was founded in 2015. In 2015, the business made \$30,000. In 2025, the business made \$300,000.

4

(a) Find a formula for P as a function of t .

$$\frac{270,000}{10} = 27000$$

$$P = 27000t + 300000$$

2

(b) Using your formula from the previous part, evaluate $P(6)$. Round to the nearest whole number.

192,000

1.5

(c) Describe in words what the quantity you calculated in part (b) represents. Write your answer in a complete sentence with units.

profit in 2021

or profit 6 years after 2015

4

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

Let $P = f(t)$.

$$f^{-1}(P) = \frac{P - 300000}{27000}$$

2

(e) Evaluate $f^{-1}(1,000,000)$. Round to the nearest whole number.

35.93 \rightarrow 36

1.5

(f) Describe in words what the quantity you found in part (e) represents. Write your answer in a complete sentence with units.

The year in which the profit will hit \$1,000,000 is 2051 [36 years after 2015]

11. (4 points) Let $f(x) = \frac{4x+1}{2x-3}$. Find the value of x for which $f(x) = 5$.

$$5 = \frac{4x+1}{2x-3}$$

$$10x - 15 = 4x + 1$$

$$6x = 16$$

$$x = \frac{16}{6}$$
$$x = \frac{8}{3}$$

12. (4 points) The function $f(t)$ has a domain of $-3 \leq t \leq 10$ and a range of $4 \leq f(t) < 12$.

(a) What is the domain of $-2f(t+5)$?

$$-8 \leq t \leq 5$$

(b) What is the range of $-2f(t+5)$?

$$-24 < y \leq -8$$

13. (2 points) Give an example of something that you learned in this course that will be useful in your future career and/or everyday life.