Test Number: 1521

MA 15800 Exam 1 Fall 2024

Student Name: _____ Section Number: _____

1. Fill out your name and section number in the space provided above. On the scantron, fill in your name, section number (see table below), test number (see above), and your student ID number (with two leading zeros). Sign your name.
2. You can write in this exam booklet. Turn in both your scantron and your exam booklet when you are done. Note: you will be graded only based on your scantron answer sheet.
3. Only a TI-30Xa scientific calculator is allowed. No other electronic devices are allowed. No books or notes are allowed.
4. The exam questions are self-explanatory. Please do not ask the proctor to explain or interpret any of the exam questions.
5. There are 15 questions. You will have 60 minutes to complete the exam. Good luck!

Section	Time	Instructor		Section	Time	Instructor
101	1:30	Cian Nolan		109	12:30	Jax Mader
102	12:30	Cian Nolan		110	11:30	Jax Mader
103	8:30	Martin Hsu		500	11:30	Jakayla Robbins
104	7:30	Martin Hsu		600	10:30	Susitha Karunaratne
105	12:30	Conner Partaker		700	7:30	Tim Delworth
106	11:30	Conner Partaker		800	8:30	Jill Shalabi
107	1:30	Zijin Liu		Y01*	Distance Learning	Jill Shalabi
108	12:30	Zijin Liu		*Students in section Y01 should enter 999 as the section number on the scantron		

Factoring Formulas

$x^3 - y^3 = (x - y)(x^2 + xy + y^2)$

$x^3 + y^3 = (x + y)(x^2 - xy + y^2)$

Sphere

$V = \frac{4}{3}\pi r^3$ $S = 4\pi r^2$

Compound Interest

$A = P\left(1 + \frac{r}{n}\right)^{nt}$ $A = Pe^{rt}$

Closed Right Circular Cylinder

$V = \pi r^2 h$ $S = 2\pi rh + 2\pi r^2$

Closed Right Circular Cone

$V = \frac{1}{3}\pi r^2 h$ $S = \pi r\sqrt{r^2 + h^2} + \pi r^2$

Pythagorean Identity

$sin^2\theta + cos^2\theta = 1$

Problem 1

(6.67 points)

Determine the y −intercept of the graph of the following function:

$f(x) = x^2 - 6x + 9$

1. (A) $(0,0)$

   (B) There is no y −intercept.

   (C) $(0,3)$

   (D) $(3,0)$

   (E) $(0,9)$

   (F) $(9,0)$

Problem 2

(6.67 points)

Given $f(x) = 3x^2 + 2x$, find and simplify $f(t+1)$.

2. (A) $3t^2 + 8t + 5$

   (B) $3t^2 + 2t + 5$

   (C) 5

   (D) $3t^2 + 2t$

   (E) $5t + 5$

   (F) $t + 1$

Problem 3

(6.67 points)

Solve the equation $9x^2 - 35x - 4 = 0$.

3. (A) $x = -4$ and $x = \frac{1}{9}$

(B) $x = -9$ and $x = 4$

(C) $x = -\frac{1}{9}$ and $x = 4$

(D) There are no real solutions.

(E) $x = -4$ and $x = 9$

(F) $x = 0$

Problem 4

(6.67 points)

Find the domain of the function $f(x) = \frac{x-1}{\sqrt{3x}}$.

4. (A) $(-\infty,1) \cup (1,\infty)$

(B) $(-\infty,\infty)$

(C) $(-\infty,0) \cup (0,1) \cup (1,\infty)$

(D) $(-1,\infty)$

(E) $(0,1) \cup (1,\infty)$

(F) $(0,\infty)$

Problem 5

(6.67 points)

Factor and simplify the expression: $(x-13)^2(7x+10)^9+(x-13)(7x+10)^4$

5. (A) $(x-13)(7x+10)^4\left((x-13)(7x+10)^5+1\right)$

(B) $(x-13)(7x+10)$

(C) $(x-13)(7x+10)\left((x-13)^2(7x+10)^9+(x-13)(7x+10)^4\right)$

(D) $(x-13)(7x+10)^4$

(E) $(x-13)(7x+10)^9\left(x-13+(7x+10)^5\right)$

(F) This expression is not factorable

Problem 6

(6.67 points)

Given $f(x)=7x-3$ and $g(x)=x^3$, find $(f\circ g)(2)$.

6. (A) 1331

(B) 88

(C) 100

(D) 8

(E) 53

(F) 11

Problem 7

(6.67 points)

Given $f(x) = 14x + 2$, find and simplify the difference quotient $\frac{f(x+h) - f(x)}{h}$.

7. (A) $\frac{14}{h}$

   (B) $14\left(\frac{x}{h}\right) + 2$

   (C) 4

   (D) 14

   (E) 16

   (F) $14\,(x + h) + 2$

Problem 8

(6.67 points)

Given $f(x) = 10x^2 + 8x - 1$ and $g(x) = \frac{1}{x}$, evaluate $3f(2) + 6g(1)$.

8. (A) 56

   (B) 99

   (C) 42

   (D) -111

   (E) 0

   (F) 171

Problem 9

(6.67 points)

Compute the average rate of change of the function $f(x) = x^2 + 2$ over the interval [3,5].

9. (A) 8

(B) 1

(C) 10

(D) 20

(E) $\frac{1}{10}$

(F) $\frac{1}{8}$

Problem 10

(6.67 points)

Determine the discriminant and the number of real solutions:

$2x^2 - 8x + 9 = 0$

10. (A) Discriminant = -136; no real solutions

(B) Discriminant = 8; two real solutions

(C) Discriminant = -8; one real solution

(D) Discriminant = 8; no real solutions

(E) Discriminant = -8; no real solutions

(F) Discriminant = -136; one real solution

Problem 11

(6.67 points)

Rationalize the numerator and simplify.

$$\frac{\sqrt{5-x}-\sqrt{5}}{x}$$

11. (A) $\dfrac{x-10}{\sqrt{5-x}-\sqrt{5}}$

(B) $\dfrac{1}{\sqrt{5-x}-\sqrt{5}}$

(C) $-\dfrac{1}{\sqrt{5-x}-\sqrt{5}}$

(D) $-\dfrac{1}{\sqrt{5-x}+\sqrt{5}}$

(E) $\dfrac{1}{\sqrt{5-x}+\sqrt{5}}$

(F) $\dfrac{x-10}{\sqrt{5-x}+\sqrt{5}}$

Problem 12

(6.67 points)

Given $f(x)=\begin{cases}3x+7 & x<0\\ x^2-10 & 0\le x\le 2\\ \sqrt{3} & 2<x\le 3\\ x^3 & x>3\end{cases}$

Evaluate $f(-1)+f(3)$

12. (A) $\sqrt{3}-9$

(B) $\sqrt{3}$

(C) $\sqrt{3}+4$

(D) -1

(E) 4

(F) 31

Problem 13

(6.67 points)

Describe how the graph of the given function is a transformation of the graph of the original function f:

$y = f(x+4) - 9$

13. (A) The graph of f is shifted 4 units to the right and 9 units down.

(B) The graph of f is reflected about the $x-$ axis, shifted 4 units to the left and 9 units down.

(C) The graph of f is reflected about the $y-$ axis, shifted 4 units to the right and 9 units down.

(D) The graph of f is shifted 4 units to the left and 9 units up.

(E) The graph of f is shifted 4 units to the right and 9 units up.

(F) The graph of f is shifted 4 units to the left and 9 units down.

Problem 14

(6.67 points)

Given $f(x) = \begin{cases} \sqrt{3x^2+1} & x < 0 \\ x & 0 \le x < 4 \\ x^2 - 9 & x > 4 \end{cases}$

Find the **domain** of $f(x)$.

14. (A) $(-\infty, 4) \cup (4, \infty)$

(B) $[0, \infty)$

(C) $[-3, 3]$

(D) $(-\infty, \infty)$

(E) $(-\infty, 0) \cup (0, 4) \cup (4, \infty)$

(F) $\left[-\frac{1}{3}, \frac{1}{3}\right]$

Problem 15

(6.67 points)

Simplify the expression:

$$\frac{\frac{1}{x+2}}{1+\frac{2}{x}}$$

15. (A) x

(B) $\dfrac{x}{3\,(x+2)}$

(C) $\dfrac{3}{x\,(x+2)}$

(D) The expression cannot be simplified

(E) $\dfrac{1}{x}$

(F) $\dfrac{x}{(x+2)(x+2)}$