MAC 1105 Exam 2

Name: ____________________________            Section: __________

While you are waiting for the test to begin, fill out your scantron. Incomplete and/or incorrectly filled out scantrons can significantly delay receiving your grade. Anything written in squares MUST be bubbled in.

Last Name, First Initial: Please bubble in left-to-right.

UFID: All 8 numbers should be written and bubbled in.

Section Number: Find your section number from the list below:

<table>
<thead>
<tr>
<th>Yuan</th>
<th>Gruber</th>
<th>Horton</th>
</tr>
</thead>
<tbody>
<tr>
<td>5876 T 11:45-12:35</td>
<td>1316 R 09:35-10:25</td>
<td>5869 T 10:40-11:30</td>
</tr>
<tr>
<td>5907 T 12:50-01:40</td>
<td>5870 R 10:40-11:30</td>
<td></td>
</tr>
<tr>
<td>5937 T 01:55-02:45</td>
<td>5880 R 11:45-12:35</td>
<td></td>
</tr>
<tr>
<td>0668 T 03:00-03:50</td>
<td>2511 R 03:00-03:50</td>
<td></td>
</tr>
</tbody>
</table>

Test Code: Your test code is A. Bubble this letter in at the top-right of your scantron.

Signature: Sign your name at the bottom-right of the back of the scantron.

When you are done with the exam, turn in this packet to your TA.

Instructions for the exam: Read and answer the following questions. Each question is worth 4 points for a total of 80 points (75 points is a 100%). No partial credit will be given for multiple choice questions.

Do not leave this page until you are instructed to begin.
1. Solve the equation.
\[ \sqrt{x + 3} = x - 3 \]
A. \{6\}
B. \{6, 13\}
C. \{1, 6\}
D. \{1, 13\}

2. Solve the equation.
\[ (x^2 + 12x)^{1/3} = 4 \]
A. \{-6 \pm 2\sqrt{6}\}
B. \{-16, 4\}
C. \{-6 \pm \sqrt{38}\}
D. \{4, -6\}

3. Solve the inequality.
\[ 11x - 12 \geq 12x - 5 \]
A. (11, \infty)
B. (-\infty, 11]
C. [7, \infty)
D. (-\infty, -7]

4. Solve the equation.
\[ | -6x + 6| = 3 \]
A. \(\left\{-\frac{1}{2}\right\}\)
B. \(\left\{\frac{3}{2}, \frac{1}{2}\right\}\)
C. \(\left\{-\frac{3}{2}, \frac{1}{2}\right\}\)
D. \(\left\{-\frac{1}{2}, -\frac{3}{2}\right\}\)
5. Solve the inequality.
\[ | -9 - 4x | > 2 \]
A. \( \left( \frac{7}{4}, \frac{-11}{4} \right) \)
B. \( \left( \frac{11}{4}, \frac{7}{4} \right) \)
C. \( (-\infty, \frac{9}{4}) \cup \left( \frac{5}{4}, \infty \right) \)
D. \( (-\infty, \frac{-11}{4}) \cup \left( \frac{-7}{4}, \infty \right) \)

6. Which of the following are graphs of functions that increase over their whole domain?

A. Graphs A and B
B. Graph D
C. Graphs A and D
D. Graphs C and D

7. Graph the function \( f(x) = \lceil x \rceil + 1 \).
A. 
B. 
C. 
D. 

Score on Page:
8. Select the equation that describes the graph shown.

![Graph Image]

A. \( y = x^2 - 3 \)
B. \( y = (x - 3)^2 \)
C. \( y = (x - 3)^2 + 1 \)
D. \( y = (x + 3)^2 \)

9. Determine whether the function is even, odd, or neither.

\( f(x) = 2x^2 - 3 \)

A. Even
B. Odd
C. Neither

10. Find \( (f/g)(x) \) when \( f(x) = \sqrt{7x - 2} \) and \( g(x) = \frac{1}{x} \).

A. \( \frac{1}{x\sqrt{7x - 2}} \)
B. \( \frac{\sqrt{7x - 2}}{x} \)
C. \( \frac{x}{\sqrt{7x - 2}} \)
D. \( x\sqrt{7x - 2} \)
11. Perform the division.

\[
\frac{x^3 - x^2 + 6}{x + 2}
\]

A. \(x^2 - 3x + 6 + \frac{6}{x + 2}\)

B. \(x^2 - 3x + 6 - \frac{6}{x + 2}\)

C. \(x^2 + 3x + 6 + \frac{6}{x + 2}\)

D. \(x^2 + 3x + 6 + \frac{6}{x + 2}\)

12. Divide \(f(x)\) by \(x - k\) for the given value of \(k\). Then express \(f(x)\) in the form \(f(x) = (x - k)q(x) + r\) where \(q(x)\) is a polynomial and \(r\) is a real number.

\(f(x) = 2x^4 - x^3 - 15x^2 + 3x\)

\(k = -3\)

A. \(f(x) = (x - 3)(2x^3 - 7x^2 + 6x - 15) + 45\)

B. \(f(x) = (x + 3)(2x^3 + 5x^2 + 3) + 9\)

C. \(f(x) = (x + 3)(2x^3 - 7x^2 + 6x - 15) + 45\)

D. \(f(x) = (x - 3)(2x^3 - 5x^2 + 3) + 9\)

13. Find \((g \circ f)(10)\) when \(f(x) = \frac{x - 2}{2}\) and \(g(x) = 2x + 5\).

A. 100

B. \(23\)

C. 13

D. 28
14. Using the given tables, find \((f \circ f)(9)\).

\[
\begin{array}{c|c}
 x & f(x) \\
\hline
 9 & 10 \\
 12 & 9 \\
 10 & 49 \\
 8 & 51 \\
\end{array}
\quad
\begin{array}{c|c}
 x & g(x) \\
\hline
 11 & 21 \\
 9 & 17 \\
 12 & 23 \\
 10 & 19 \\
\end{array}
\]

A. 9  
B. 23  
C. 19  
D. 49

15. If \(f\) is one-to-one, find an equation for its inverse.

\(f(x) = x^3 - 8\)

A. \(f^{-1}(x) = \sqrt[3]{x - 8}\)  
B. \(f^{-1}(x) = \sqrt[3]{x + 8}\)  
C. \(f^{-1}(x) = \sqrt[3]{x} + 8\)  
D. The function is not one-to-one.

16. Choose the graph that satisfies the following properties:

**Domain:** \((-\infty, 0] \cup (2, \infty)\)

**Range:** \([2, \infty)\)

**Increasing:** \((2, \infty)\)

**Decreasing:** \((-\infty, 0)\)

**Continuous:** \((-\infty, 0] \cup (2, \infty)\)

A.  
B.  
C.  
D.
17. When asked to find the Difference Quotient for the equation \( f(x) = 4x^2 - 2x - 5 \), a student submitted the following:

\[
\begin{align*}
\text{Line 1: } & \quad \frac{f(x + h) - f(x)}{h} \\
\text{Line 2: } & \quad \frac{4(x + h)^2 - 2(x + h) - 5 - 4x^2 - 2x - 5}{h} \\
\text{Line 3: } & \quad \frac{4x^2 + 4h^2 - 2x - 2h - 5 - 4x^2 - 2x - 5}{h} \\
\text{Line 4: } & \quad \frac{4h^2 - 4x - 2h - 10}{h}
\end{align*}
\]

A. The student knows they made at least one error. State which line (or lines) the student made an error in and why it is an error.

B. Find the Difference Quotient for the equation \( f(x) = 4x^2 - 2x - 5 \).
18. Factor the following polynomial completely.
\[ x^4 - 2x^3 - 6x^2 + 22x - 15 \]
19. A. Fill in the following table.

<table>
<thead>
<tr>
<th>$x$</th>
<th>$f(x)$</th>
<th>$g(x)$</th>
<th>$g(f(x))$</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>5</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B. Is $f(g(x)) = g(f(x))$ for every value of $x$ given in the table? Support your answer with evidence.
20. The Physics department held an open competition between their students to build the “best” trebuchet. Trebuchets competed for one of two categories: (1) highest throw and (2) longest time ball spent in the air. The winning teams’ trebuchets are modeled by the equations below.

Team Einstien: \( E(x) = -9.8x^2 + 78.4x - 68.6 \)

Team Newton: \( N(x) = -17.64x^2 + 123.48x - 105.84 \)

Each of the trebuchets above had one thing in common: they were built with a delay to throw the ball exactly 1 second after starting the machine. [Think about what this means!]

Which team won category 1 (highest throw)? Which team won category 2 (longest time ball spent in the air)? Support your answers with evidence.