INSTRUCTIONS: No calculators may be used on the test. No books, no notes, no questions, and talking allowed. You must always explain your answers and show your work to receive full credit. Use the back of these pages if necessary. Print (use CAPITAL LETTERS) and sign your name, and indicate your section below. GOOD LUCK!

Surname, Name: __________________________

Student ID no: ____________________________________________

Signature: ____________________________________________

Section (Check One):

Section 1 (Vahap Erdoğdu) :
Section 2 (Burak Özbek- MW: 11:30-13:20):
Section 3 (Özgür Mustecaplıoğlu):
Section 4 (Tolga Eşçi - MW: 9:30-11:20):
Section 5 (Tolga Eşçi - MW: 12:30-14:20):
Section 6 (Burak Özbek- MW: 14:30-16:20):

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>POINTS</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>20</td>
<td>10</td>
<td>100</td>
</tr>
</tbody>
</table>

SCORE
Name:

Problem 1 (10 pts) Let

\[ f(x) = \begin{cases} 
\arctan\left(\frac{1}{x}\right), & x > 0; \\
 a + x, & x \leq 0.
\end{cases} \]

Find the value for \( a \) that will make \( f \) continuous.

Problem 2 (10 pts) Find the tangent line to the graph of

\[ f(x) = \int_0^{x^2} \sqrt{1 + t^3} \, dt \]

at \( x = \sqrt{2} \).
Name:

Problem 3 (10 pts) Find $f'(1)$ if

$$f(x) = \frac{\sin(\ln x)}{\cos(e^x)}.$$ 

Problem 4 (10 pts) Find the following limit.

$$\lim_{n \to \infty} \left( \frac{3 + n}{n} \right)^{2n}$$
Name:

Problem 5 (10 pts) Evaluate the following integral.

\[ \int_0^1 x^2 e^x \, dx \]
Problem 6 (10 pts) Find the area of the region bounded by the curves \( y = x^2 - 2 \) and \( y = -|x| \).
Problem 7 (10 pts) Determine whether the following improper integral is convergent or divergent. Evaluate the integral if it is convergent.

\[ \int_{2}^{\infty} \frac{2}{x^2 - 1} \, dx \]

Problem 8 Determine whether each of the following infinite series is convergent or divergent.

(8.a)(5 pts)

\[ \sum_{n=1}^{\infty} \frac{n^2 + 2n + 3}{2n^3 + 5n + 4} \]
Name:

(8.b) (5 pts)

\[ \sum_{n=1}^{\infty} \cos\left(\frac{1}{n}\right) \]

(8.c) (10 pts)

\[ \sum_{n=1}^{\infty} \frac{2^n n! n!}{(2n)!} \]
Problem 9 (10 pts) Find the radius of convergence and the interval of convergence of the following power series.

\[ \sum_{n=1}^{\infty} \frac{x^n}{\sqrt{n}3^n} \]