Test 1

Please show your work. Each numbered problem is worth 10 points.

**Problem 1** Complete the following table of values:

<table>
<thead>
<tr>
<th>( \theta )</th>
<th>(-\pi/6)</th>
<th>(-3\pi/4)</th>
<th>( \pi )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \sin \theta )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \csc \theta )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \tan \theta )</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Problem 2** What are the domains and ranges of the following functions?

a) \( y = x^{1/2} \)?

b) \( y = \log_7(x + 1) \)

c) \( y = e^x + 2 \)

**Problem 3** Let \( f(x) = x - 3 \), \( g(x) = \sqrt{x} \), \( h(x) = x^3 \), and \( j(x) = 2x \). Express each of the following as a composite involving one or more of \( f, g, h, \) and \( j \).

a) \( y = x^{1/4} \)

b) \( y = \sqrt{x^3 - 3} \)

c) \( y = (2x - 6)^3 \)
Problem 4  Define a function $f$ as

$$ f(x) := \begin{cases} x + 1 & \text{if } -1 \leq x \leq 1 \\ 0 & \text{elsewhere} \end{cases} $$

Sketch each of the following:

a) $f(x)$

b) $2f(x)$

c) $f(2x)$

d) $f^{-1}(x)$
Problem 5  Find the average rate of change of the function \( y(x) = \sin(x) \) on the interval \([0, \pi/2]\).

Problem 6  Consider the function \( y = x^2 - 4x \).

   a)  Formally find the slope of the function at the point \( P = (2,0) \).

   b)  Use your answer in part a) to find the equation of the tangent line at \( P \).

Problem 7  Express the following in terms of \( \ln 5 \) and \( \ln 7 \):

   a)  \( \ln(1/125) \)

   b)  \( \ln(49/35) \)

   c)  \( \ln(e^{\ln 25}) \)