This white-pages test has problems 1 – 11. Take a moment to make sure you have them all.

No Calculators Allowed; No Reference Materials; Just You and Your Pencil and Eraser.

1 Quickly fill in the table with the exact values of the trigonometric functions for the given clock-face angles:

<table>
<thead>
<tr>
<th>Hour</th>
<th>$\theta$ rad</th>
<th>$\sin(\theta)$</th>
<th>$\cos(\theta)$</th>
<th>$\tan(\theta)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 PM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 PM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1:30 PM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 PM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 noon</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2 Fill in the table with the exact values for the missing entries:

<table>
<thead>
<tr>
<th>Hour</th>
<th>$\theta$ rad</th>
<th>$\sin(\theta)$</th>
<th>$\cos(\theta)$</th>
<th>$\tan(\theta)$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$-\sqrt{2}$</td>
<td>$\sqrt{2}$</td>
<td>$\sqrt{2}$</td>
<td>$2$</td>
</tr>
</tbody>
</table>

3 Find the trigonometric form of the complex number $-\frac{3}{2} + \frac{\sqrt{3}}{2}i$
Consider the graph of $f$ shown.

(a) Make a sign-change chart for the expression $f(x)f^{-1}(x)$ on the interval $[-3, 3]$.

(b) Make a sign-change chart for the expression $f(f^{-1}(x))$ on the interval $[-3, 3]$.

5 Show steps in simplifying the trigonometric expression:

$$\frac{\cos(x)}{1 - \sin(x)} - \frac{1 + \sin(x)}{\cos(x)}$$
6. Give a proof, which “flows” from one side to the other, of the identity

\[
\frac{\cos(x)}{\cos(x) - \sin(x)} - \frac{\sin(x)}{\cos(x) + \sin(x)} = \sec(2x)
\]

7. Let \( \theta \in \left[-\frac{3\pi}{2}, -\pi\right] \) and \( \sin(\theta) = \frac{12}{13} \). Show steps in computing the following:

(a) \( \cos(\theta) = \) \quad (c) \( \cos(2\theta) = \)

(b) \( \sin(2\theta) = \) \quad (d) \( \sin(\theta/2) = \)
8 Consider the functions

\[ f(x) = 8 \cos \left( 3x + \frac{\pi}{6} \right) \quad \quad g(x) = 8 \cos \left( 3\pi x + \frac{\pi}{6} \right) \]

On separate graphs, show one cycle of each of the functions, labeling salient points with their coordinates.
Let \( K(x) = \left( x - \frac{\pi}{3} \right) \cos(x) \). Make a sign-change chart for \( K(x) \) for \( x \in [0, 2\pi] \).

10 Give right-hand sides for the identities:

(a) \( \sin(x) \cos(y) + \cos(x) \sin(y) = \) ____________

(b) \( \sin(x) \sin(y) + \cos(x) \cos(y) = \) ____________

(c) \( \sin(x) \cos(x) = \) ____________

(d) \( 1 + \tan(\theta)^2 = \) ____________

(e) \( \tan(x + y) \left[ 1 - \tan(x) \tan(y) \right] = \) ____________

(f) \( 1 - 2\sin(y)^2 = \) ____________
11 Derive (that is, prove) either the formula for $\cos(\alpha - \beta)$ or the formula for $\cos(\alpha + \beta)$. You may assume only the basic unit-circle definitions of the sine and cosine.