1) \( \cot \frac{5\pi}{4} \)

\[
\tan \frac{5\pi}{4} = 1 \quad \frac{1}{1} = 1
\]

2) \( \sec \frac{7\pi}{6} \)

\[
\cos \frac{7\pi}{6} = \frac{1}{2} \quad \frac{1}{2} = \frac{3}{2}
\]

3) \( \cos (-2\pi/3) \)

\[
\cos \frac{-2\pi}{3} = \frac{1}{2}
\]

4) \( \sec \frac{7\pi}{4} \)

\[
\cos \frac{7\pi}{4} = \frac{1}{2} \quad \frac{1}{2} = \frac{\sqrt{2}}{2}
\]

5) \( \sec \frac{5\pi}{3} \)

\[
\cos \frac{5\pi}{3} = \frac{1}{2} \quad \frac{1}{2} = 2
\]

6) What is the phase shift & horizontal shift of the function \( h(t) = 4\cos(\pi t - \frac{\pi}{2}) + 3 \)?

Sketch this graph for one cycle (be sure to include all important labels and landmarks.)

7) Prove the following trigonometric identity.

\[
\frac{1 + \sec \theta}{1 - \sec^2 \theta} = \frac{\cos \theta}{\cos \theta - 1}
\]

\[
\left( \frac{1 + \sec \theta}{1 - \sec \theta} \right) \cdot \frac{\cos \theta}{\cos \theta - 1} = \frac{1}{1 - \sec \theta}
\]
WITH CALCULATOR:

8) Suppose that you are on a Ferris wheel that turns in a counter-clockwise direction, and that your height (in feet) above the ground at time \( t \) (in minutes) is given by:

\[ h(t) = 15\sin(\pi t) + 20 \]

a) How high above the ground are you at \( t = 0 \)?

\[ 20 \text{ ft} \]

b) What is your position on the wheel at \( t = 0 \)?
(e.g., the twelve o’clock position)

\[ 3 \text{ o’clock} \]

c) How long does it take to make one revolution?

\[ \theta = \frac{2\pi}{\omega} = 2 \text{ min} \]

d) What is your height at after being on the ride for 45 seconds?

\[ 45 \text{ sec's} = \frac{45}{60} = \frac{3}{4} \text{ of } .75 \text{ minutes} \]

\[ h(0.75) = 15\sin(\pi(0.75)) + 20 = 30.6 \text{ ft} \]

e) What arc length does a car on this ferris wheel travel through in 1.5 minutes?

\[ r = 15 \]
\[ \theta = \frac{3\pi}{2} \]

\[ s = \frac{3\pi \sqrt{15}}{2} \approx 70.7 \text{ ft} \]

9) Starting one year before an election, a study was conducted to determine the popularity of the candidates. In the table below, \( A(t) \) represents the percent of the electorate that favor candidate \( A \), \( t \) months after the start of the study.

<table>
<thead>
<tr>
<th>( t )</th>
<th>0</th>
<th>3</th>
<th>6</th>
<th>9</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>( A(t) )</td>
<td>22</td>
<td>42</td>
<td>62</td>
<td>42</td>
<td>22</td>
</tr>
</tbody>
</table>

1. Express \( A \) as a trigonometric function of \( t \). Be sure to express your answer using exact values.

\[ A(t) = -20\cos\left(\frac{\pi}{6} t \right) + 42 \]

2. Support for candidate \( B \) is given by \( B(t) = 31 + 15\sin\left(\frac{\pi}{6} t \right) \) and support for candidate \( C \) is given by \( C(t) = 42 - 20\sin\left(\frac{\pi}{6} t + \frac{\pi}{2} \right) \). For what value(s) of \( t \), to the nearest integer, are candidates \( B \) and \( C \) tied for support?

\[ t = 3 \text{ and } 11 \]

10) Find the length of the arc in the following diagram (nearest 100th).

\[ S = \theta \cdot r \]

\[ S = (3.41)(\sqrt{3}) \]

\[ S \approx 5.897 \]

\[ (24, 90) \]

\[ S = \sqrt{(-7)^2 + (-2)^2} \]

\[ r = \sqrt{53} \]

\[ \theta_{ref} = \tan^{-1}\left(\frac{2}{7}\right) \]

\[ \theta = \pi + \theta_{ref} = \pi + \tan^{-1}\left(\frac{2}{7}\right) \approx 3.41989 \]