Do any seven (7) of the following.

1. [10 points] A bicyclist’s position is given by the function $s(t) = 3t - 2t^2$ where $t$ is measured in seconds and $s(t)$ is measured in meters. The function $Q(h)$, below, gives the average velocity of the bicyclist from time $t = 0.5$ to time $t = 0.5 + h$.

$$Q(h) = \frac{s(0.5 + h) - s(0.5)}{h}.$$  

Use your calculator to fill in the following table and then “guess” what the function $Q$ should output for the input $h = 0$ (even though that input is not in the domain of $Q$).

<table>
<thead>
<tr>
<th>$h$</th>
<th>0.1</th>
<th>0.001</th>
<th>0.00001</th>
</tr>
</thead>
<tbody>
<tr>
<td>$Q(h)$</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. [10 points] Compute $\cot (\arcsin (x))$.

3. [10 points] Given $F(x) = \sqrt{\tan(x^2 + 1)}$. Write down three functions $f, g, h$ with the property that $(f \circ g \circ h)(x) = F(x)$.

4. [10 points] An open box with a square base is to be built for $48.00. The sides of the box will cost $3.00 per square foot and the base will cost $4.00 per square foot. Express the volume of the box as a function of the length of one side of its (square) base.

5. [10 points] Write the equation of the circle whose graph is the result of moving the graph of $x^2 + y^2 - 4x + 8y - 5 = 0$ two units to the right and three units down.

6. [10 points] Write the equation of the circle that has $(-3, 2)$ and $(5, -8)$ as the ends of a diameter.

7. [10 points] Find values for the constants $c$ and $\delta$ so that the numbers $x$ in the interval $-7 < x < -1$ are the same as the numbers $x$ that satisfy the inequality $|x - c| < \delta$.

8. [5 points each] Do both of the following.

   (a) Give an example of an even function that is not $f(x) = x^2$ or $g(x) = \cos(x)$ and use the symbolic definition (not a graph) to show it is even.

   (b) Give an example of a function that is neither even nor odd and use the symbolic definition (not a graph) to show it fails to be odd.