1. (4 points) Determine the domain of the given function.

\[ f(x) = \frac{\sqrt{25 - x^2} + \sqrt{9 + \sin(x - 1)}}{x^2 - 8x - 20} \]

\[ = \frac{\sqrt{25 - x^2} + \sqrt{9 + \sin(x - 1)}}{(x + 2)(x - 10)} \]

To be certain we do not take the square root of a negative number or divide by 0, we must have

\[ 25 - x^2 \geq 0 \]
\[ x^2 \leq 25 \]
\[ -5 \leq x \leq 5 \]

\[ 9 + \sin(x - 1) \geq 0 \]
\[ \sin(x - 1) \geq -9 \]
\[ \text{always true since } -1 \leq \sin(x - 1) \leq 1 \]

\[ x \neq -2 \text{ and } x \neq 10 \]

The domain of \( f \) is \([-5, -2) \cup (-2, 5]\)
2. (3 points) Given an acute angle $\theta$ for which $\sec(\theta) = 8$, evaluate the following quantities.

(a) $\cos(\theta) = \frac{1}{8}$

(b) $\sin(\theta) = \frac{\sqrt{63}}{8}$

(c) $\cos(\pi + \theta) = -\cos(\theta) = -\frac{1}{8}$

or from appendix D,

$\cos(x+y) = \cos(x)\cos(y) - \sin(x)\sin(y)$

$\cos(\pi + \theta) = \cos(\theta)\cos(\pi) - \sin(\theta)\sin(\pi)$

$= -1\cdot\cos(\theta) - 0\cdot\sin(\theta)$

$= -\cos(\theta) = -\frac{1}{8}$

3. (3 points) Suppose that $f(x)$ is an odd function. If $g(x) = x^4\sin(f(x))$, then is $g(x)$ an odd function, an even function or neither? Give a very clear justification for your answer.

$g(x) = x^4\sin(f(x))$

$g(-x) = (-x)^4\sin(f(-x))$

$= x^4\sin(-f(x))$ since $f$ is odd

$= x^4\sin(f(x))$ since $\sin$ is odd.

$= -x^4\sin(f(x))$

$= -g(x)$

Therefore, $g$ is an odd function.