1. (3 points) Given an acute angle $\theta$ for which $\cos(\theta) = \frac{2}{3}$, evaluate the following quantities.

(a) $\sin(\theta)$

That is acute $\Rightarrow \sin(\theta) = \sqrt{\frac{5}{3}}$.

(b) $\cos(\pi + \theta)$

Using the unit circle and the formula for $\cos(\pi + \theta)$:

\[
\cos(\pi + \theta) = -\cos(\theta) = -\frac{2}{3}
\]

(c) $\sin\left(\frac{\pi}{2} - \theta\right)$

Method 1:

Using the unit circle and the formula for $\sin\left(\frac{\pi}{2} - \theta\right)$:

\[
\sin\left(\frac{\pi}{2} - \theta\right) = \cos(\theta) = \frac{2}{3}
\]

Method 2:

Using the formula for $\sin(\pi - \theta)$:

\[
\sin\left(\frac{\pi}{2} - \theta\right) = \sin(\pi - \theta) = \sin(\theta) = \frac{\sqrt{5}}{3}
\]
2. (4 points) Determine the domain of the given function.

\[ f(x) = \frac{\sqrt{x^2 + 4}}{\sqrt{25 - 4x} - \sqrt{x + 9}} \]

1. From \( \sqrt{x^2 + 4} \), \( x^2 + 4 \geq 0 \) (always true, no restriction on domain)

2. From \( \sqrt{25 - 4x} \), \( 25 - 4x \geq 0 \) \( \Rightarrow \) \( -4x \geq -25 \)
\[ \Rightarrow x \leq \frac{25}{4} \]

3. From \( \sqrt{x + 9} \), \( x + 9 \geq 0 \) \( \Rightarrow \) \( x \geq -9 \)

4. Denominator = 0 when \( \sqrt{25 - 4x} - \sqrt{x + 9} = 0 \)
\[ \Rightarrow \sqrt{25 - 4x} = \sqrt{x + 9} \]
\[ \Rightarrow 25 - 4x = x + 9 \]
\[ \Rightarrow 16 = 5x \]
\[ \Rightarrow x = \frac{16}{5} \]

Thus \( x \neq \frac{16}{5} \)

**Domain of \( f \): \( [-9, \frac{16}{5}) U (\frac{16}{5}, 4] \)
3. (3 points) Determine whether the following function is even, odd or neither. Give a very clear justification for your answer.

\[ g(t) = \cos(t^3) - \sin(t^4) \]

\[ g(-t) = \cos((-t)^3) - \sin((-t)^4) \]

\[ = \cos(-t^3) - \sin(t^4) \]

\[ = \cos(t^3) - \sin(t^4) \] (since \( \cos \) is even)

\[ = g(t) \]

\( g \) is an even function.