1. (5 pts) Consider the function,

\[ y = \sqrt{6 - x^2} \]

Find the domain of this function. Determine the \( x \) and \( y \)-intercepts. Sketch a graph of the function.

\[ -2.4495 \leq x \leq 2.4495 \]

Domain: \(-\sqrt{6} \leq x \leq \sqrt{6}\)

\( x \)-intercepts \( \pm \sqrt{6} \)

\( y \)-intercept \( \sqrt{6} \)

Sketch of Graph:

![Sketch of Graph](image)

2. (7 pts) Consider the function,

\[ y = \frac{8 + 3x}{x - 4} \]

find the domain. Find all \( x \) and \( y \)-intercepts. Determine any horizontal or vertical asymptotes. (If no asymptote exists, then write “NONE.”) Sketch the graph.

Domain: \( x \neq 4 \)

\( x \)-intercept \( -\frac{8}{3} \) and \( y \)-intercept \( -2 \)

Vertical Asymptote: \( x = 4 \)

Horizontal Asymptote: \( y = 3 \)

GRAPH:
2. (8 pts) The Lambert-Beer law for absorbance of light by a spectrophotometer is a linear relationship, which can have the form,

\[ A = mc, \]

where \( c \) is the concentration of the sample, \( A \) is absorbance, and \( m \) is the slope that must be determined from standards.

a. Below are data collected on samples from a collection of acid standards using an acid indicator.

\[
\begin{array}{c|ccc}
\text{c (mM)} & 1 & 2 & 5 \\
A & 1.7 & 3.2 & 8.3 \\
\end{array}
\]

Write all the square errors. Write a quadratic function \( J(m) \) that measures the sum of squares error based on the standards above for the line fitting the data. Find the vertex of this quadratic function.

\[
e_1^2 = (1.7 - m)^2 = 2.89 - 3.4m + m^2
\]

\[
e_2^2 = (3.2 - 2m)^2 = 10.24 - 12.8m + 4m^2
\]

\[
e_3^2 = (8.3 - 5m)^2 = 68.89 - 83.0m + 25m^2
\]

\[
J(m) = 30 + m^2 + 99.2m + 82.62
\]

The vertex location \( m_0 = 1.4533 \).

b. The vertex gives the value of the best slope \( m \). Use this model (with the best value of \( m \)) to determine the concentration of an unknown sample with an absorbance of \( A = 2.5 \).

\[
c = 1.5121 \quad \quad \quad c = \frac{A}{m} = \frac{2.5}{1.4533}
\]