Directions: Please answer the following questions and make sure your answer are legible. You must show your work to receive credit for your answers. You may not use a calculator (or any other technology) on this quiz. Good Luck.

1. (8 points) David has 400 yards and wishes to enclose a rectangular area.
   (a) Express the Area of the rectangle as a function of the width of the rectangle.
   (b) For what value of w is the area the largest?
   (c) What is the maximum area?

   \[
   \begin{align*}
   A &= l \cdot w \\
   A(w) &= (200-w)w \\
   A(w) &= -w^2 + 200w \\
   \text{or} \\
   A(w) &= -(w^2 - 200w) \\
   A(w) &= -(w^2 - 200w + 100^2) - 100^2(-1) \\
   A(w) &= -(w-100)^2 + 100^2 \\
   \text{vertex} &= (100, 10000) \\
   \end{align*}
   \]

   There is a Question on the Back!
2. (9 points) For \( f(x) = \frac{-1}{2}(x + 4)(x - 1)^3 \)

(a) Determine the end behavior of the graph of the function
(b) Determine the zeros of the function and their multiplicity.
(c) Determine if the function touches or crosses the \( x \)-axis at each \( x \)-intercept
(d) Draw a rough sketch of \( f(x) \).

\[ \text{behaves like } y = \frac{-1}{2}(x)(x)^3 \]

\[ \text{behaves like } y = \frac{-1}{2}x^4 \]

\begin{itemize}
  \item a) \( x \rightarrow \infty \) \quad y \rightarrow -\infty
  \item c) \( x \rightarrow \infty \) \quad y \rightarrow -\infty
\end{itemize}

\[ \begin{array}{|c|c|c|}
\hline
\text{zero} & \text{mult} & \text{T/c} \\
\hline
-4 & 1 & \text{cros} \\
1 & 3 & \text{cros} \\
\hline
\end{array} \]

other in & is optimal: \( y \text{ int} = +2 \)

behavior near root above/below \( x \)-axis etc.

3. (3 points) \( h(x) = (x + 2)(x - 4)^3 \)

(a) Identify the \( x \)-intercepts of the graph \( h \).
(b) What are the \( x \)-intercepts of the graph of \( y = h(x - 2) \)

a) \((-2, 0) \) & \((4, 0) \)

b) \( h(x-2) \) is \( h(x) \) shifted right 1

so \( x \)-int's \((0, 0)\) and \((6, 0)\)