3. The four control points for a cubic Bezier curve are shown in the figure below. The blending functions are,

- for $P_0$, $(1 - u)^3$
- for $P_1$, $3u(1 - u)^2$
- for $P_2$, $3u^2(1 - u)$
- for $P_3$, $u^3$

Calculate the exact value of the coordinates of the curve at $u = 1/2$. Using this information and what you know about how the slope of the curve must behave at the endpoints, draw a reasonably accurate picture of the entire curve from $P_0$ to $P_3$. Answer: The blending function values for $u = 1/2$, in order are: $1/8, 3/8, 3/8, 1/8$. Using these as the weights for the four $x$ values, $0, 0, 1, 1$, gives a weighted sum of $x = 1/2$, as we'd expect. Weighting the $y$ values $0, 1, 1, 0$, gives a weighted sum of $3/4$, so the point is $P(1/2) = (1/2, 3/4)$, which is within the convex hull (the square). Below we show the Bezier curve drawn in a standard drawing application, using the same control points. The curve at each endpoint is vertical, as it must be, because the corresponding control points are directly above the endpoints.

![Bezier Curve Diagram](image)

4. This question focuses on clipping the five-sided polygon shown below against the upper edge of the rectangular window. The Sutherland-Hodgeman polygon clipping algorithm creates a single polygon and in this case will produce a spurious line along part of the upper boundary. The Weiler-Atherton algorithm can build more than one polygon and does not leave a spurious line. Show how the Weiler-Atherton algorithm traces the appropriate boundaries as it moves around the polygon and window edge, starting at vertex $V_1$. Only consider clipping against the upper window edge in this question.

![Polygon Clipping Diagram](image)

Answer: This answer is virtually identical to the illustration in Fig. 6-25 in the text. Starting at $V_1$, the three vertices $V_1'$ and $V_2$ and $V_2'$ are retained. Then the path turns right at the boundary, ending at $V_1'$, completing the first polygon. The algorithm resumes at $V_3$, and follows a similar procedure to create the polygon $V_3', V_4, V_4'$. 
