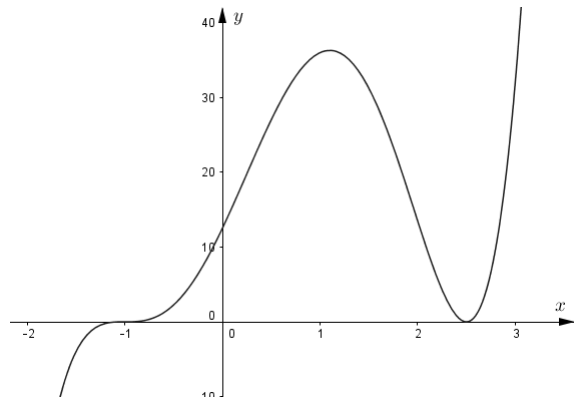


Write all responses on separate paper.

Show work for credit. No calculator/notes.

- A bowling ball thrown by a bowler follows a parabolic trajectory given by the graph of the equation  $h(t) = 4 - 4\left(t - \frac{1}{2}\right)^2$ , where  $t$  is the time since ball was thrown and  $h(t)$  is the height of the ball above the ground at time  $t$ .
  - What is the maximum height the bowling ball reaches?
  - When does the bowling ball hit the ground?
- Consider the polynomial function  $f(x) = x^3 - \frac{5}{2}x^2 + \frac{1}{2}$ 
  - Explain why this function does not satisfy the condition for the theorem on rational zeros. Write a function with the same zeros that does satisfy the condition.
  - List all the possible rational zeros of the function.
  - Write a complete factorization for the function.
  - construct a careful graph of the function.
- Consider the polynomial function  $p(x) = 3x^4 + 10x^3 + 4x^2 - 5x - 2$ .
  - What does Descartes' rule of signs say about the number of positive and negative zeros of  $p$ ?
  - Use the Remainder Theorem to evaluate  $p(-4)$  and find  $q(x)$  so that  $p(x) = (x + 4)q(x) + p(-4)$ .
  - Find  $P(1)$  and explain why there must be a zero in the interval  $(0, 1)$
  - List all the possible rational zeros of  $p(x)$ , according the theorem on rational zeros.
  - Find all the zeros of  $p(x)$ .
- Write a formula for the polynomial function of degree 5 whose graph is shown:



- Consider the rational function,  $r(x) = \frac{x^3 - 2x^2 - 3x}{x^2 - 4}$ 
  - What are the intercepts?
  - What asymptotes does it have?
  - Construct a table of values and a graph for the function.
- Solve the inequality  $x \geq \frac{16 - x}{2x + 3}$
- Find the domain of the function  $f(x) = \frac{1}{\sqrt{2x^3 + 7x^2 + 4x - 4}}$