Classwork 54
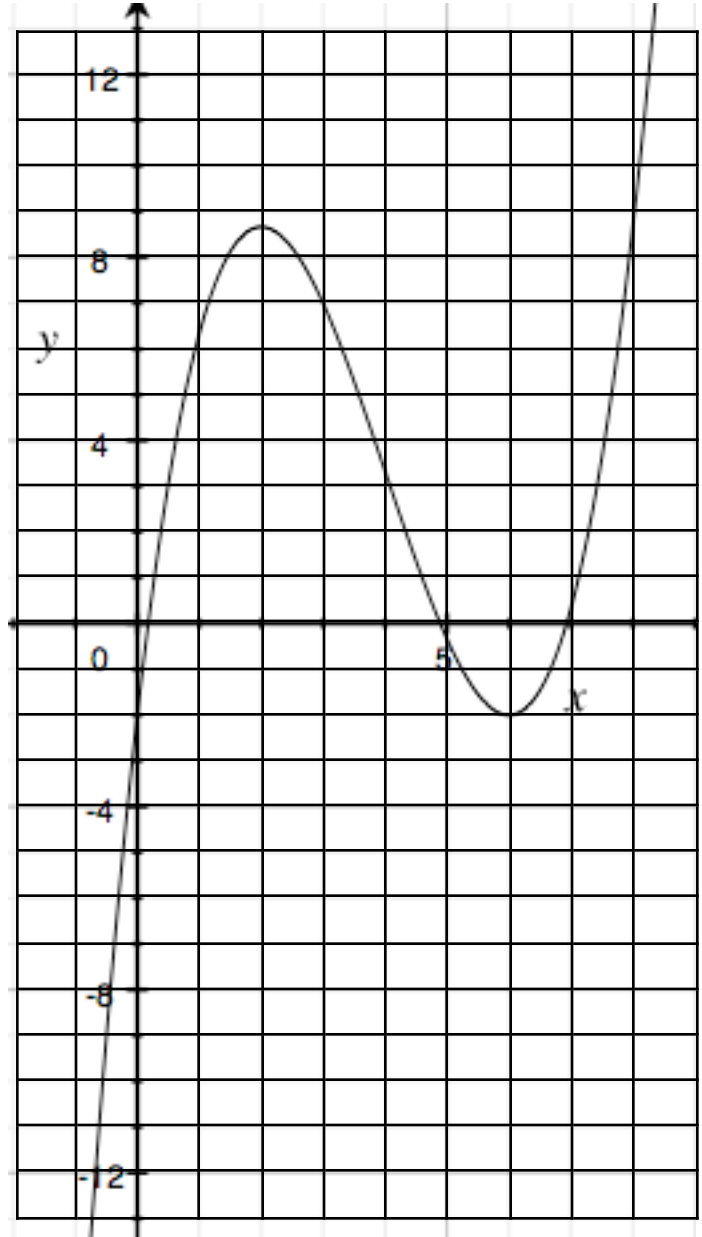
1. The graph below shows $y = 1/3x^2 - 4x^2 + 12x - 2$.

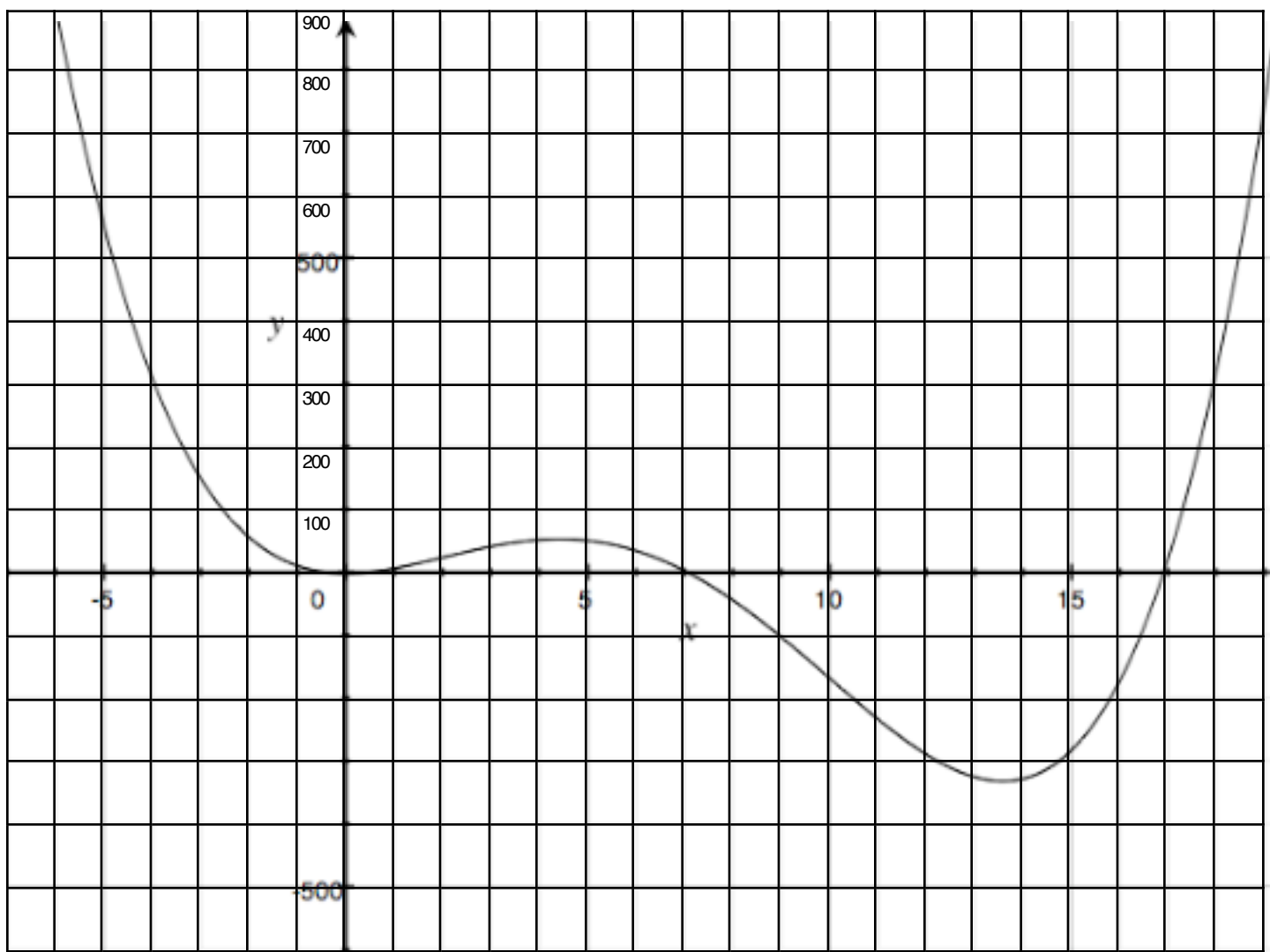a) Use calculus to find when the derivative is 0.

b) Use calculus to find when the derivative is positive and when it is negative.

c) Use calculus to find when the **curvature** is positive and when it is negative.

d) Where does the curvature = 0, leading to an **inflection point**?

2. The graph below shows $y = \frac{1}{12}x^4 - 2x^3 + 10x^2 - 2$

a) Where are the maxima and minima of this graph? Find the exact answer using calculus.

b) Where are the inflection points and where does the graph have positive and negative curvature? Find the exact answer using calculus.

3. a) Explain using calculus why a parabola always has both regions of positive slope and regions of negative slope.

   b) What is the only coefficient that matters in whether a parabola opens upward or downward? (Consider the general form $y = ax^2 + bx + c$)

   c) Explain using calculus why a parabola has **either** negative or positive curvature but never both.

4. a) Sketch a graph of the function $y = x^4$

   b) Why does the function never dip into negatives?

   c) Why is the slope sometimes positive and sometimes negative?

   d) Why is the curvature always positive?

5. a) Sketch a graph of the function $y = x^4 - x^2$

   b) When is the function negative?

   c) What are the maxima and minima of the function?

   d) Where does the curvature change?