

You should work through this as you would an actual exam. Time yourself, and try to solve each problem alone without using your notes or your book.

1. Sketch a graph of  $f(x) = x^4 - 24x^2 + 144$  entirely by hand (including all algebraic computations). Show all maxima and minima, inflection points, zeros, and asymptotes.
2. Use your calculator to produce graphs of the first and second derivatives of  $f(x) = 6x^5 - 45x^4 + 40x^3 + 450x^2 - 1350x$ . Sketch a copy of the graphs, and use them to locate the  $x$ -values of all critical points, local maxima and minima, and inflection points of  $f(x)$ .

3. Find

$$\lim_{x \rightarrow \infty} \left[ x^3 \cot \left( \frac{\pi}{x} \right) \right]$$

4. Find

$$\lim_{x \rightarrow 0^+} (\sin x)^{(\sin x)}$$

5. Find the dimensions of the rectangle of perimeter  $P$  with an inscribed ellipse of maximal area.
6. Use Newton's method to approximate the zero of  $-1 + \ln x$  to the maximum accuracy supported by your calculator. Show all arithmetic for the first two steps, and show the value of all subsequent  $x_n$ 's.