1. During an epidemic the rate of new infections is proportional to the number of already infected people. If initially there were 200 infections, and the rate of new infections was 40 people per day, how many people would be infected by the end of the first week?

No Calculators. Solve each problem in the blue book. Number your solutions according to the corresponding problems. No points will be given for answers with no explanation. Put final answers in the provided boxes on this page. In the end staple this page to the inside front cover of the blue book, so that this side faces the white pages.

2. Find.
   a) \( \frac{d}{dx} \left[ (x^3 - 2) \sin(2x - 3) \right] \)
   b) \( \frac{d}{dx} \left( \frac{\ln x}{x^2} \right) \)
   c) \( \int 2 \cos \left( \frac{4\pi}{3} x \right) \, dx \)

3. \( y'' = e^{-2t} \).
   a) Find the general solution of the differential equation.
   b) If \( y(0) = \frac{5}{2} \), and \( y'(0) = \frac{1}{2} \), what is the particular solution?

4. Find any local minima and maxima of the function \( f(x) = (x - 1)^2(x + 3) \)

5. The height of the water in a harbor varies like a sine wave with a period of 11 hours. The maximum height is 12 m, and the minimum height is 6 m. At time \( t = 0 \) the height is 12 m.
   a) What are the amplitude and frequency of this sine wave?
   b) Write down a function that gives the height of water in the harbor at time \( t \).