1. Whenever possible, find the $x$-intercepts, the $y$-intercept, the critical points, the regions of increase and decrease, the inflection points, asymptotic behavior, and concavity for each of the following functions. You may summarize these data in sign charts. Then sketch a graph of the function.

$$f(x) = 4x^3 - x^4 = x^3(4 - x) \quad \text{intercept} \quad x = 0, x = 4$$

$$f'(x) = 12x^2 - 4x^3 = 4x^2(3 - x) \quad \text{critical points} \quad x = 0, x = 3$$

$$f''(x) = 24x - 12x^2 = 12x(2 - x) \quad \text{inflection points} \quad x = 0, x = 2$$

$$f(3) = 4 \cdot 27 - 9 = 27$$

$$f(2) = 8(2) = 16$$

2. Compute the limit:

$$\lim_{x \to 0} \frac{3^x - 1}{2^x - 1} = \lim_{x \to 0} \frac{\ln(3)^x}{\ln(2)^x} = \frac{\ln(3)}{\ln(2)}$$

indef. form

form $\frac{0}{0}$