Q1. Show that $\tanh(\ln x) = \dfrac{x - x^{-1}}{x + x^{-1}}$

$$\tanh(\ln x) = \frac{e^{\ln x} - e^{-\ln \bullet x}}{e^{\ln x} + e^{-\ln \bullet x}} = \frac{x - x^{-1}}{x + x^{+1}}$$

Q2. Find all the values of c in $(-2, 1)$ that satisfy the conclusion of the Mean Value Theorem for $f(x) = x^2$

$$f'(x) = 2x$$

$$f'(c) = 2c = \frac{f(1) - f(-2)}{1 - (-2)} = -1$$

$$c = -\frac{1}{2}$$

Q3. Find $\lim\limits_{x \to \infty} x^{\frac{1}{x}}$

$$y = \lim_{x \to \infty} x^{\frac{1}{x}}$$

$$\ln y = \lim_{x \to \infty} \frac{1}{x} \ln x \quad \left(\frac{\infty}{\infty}\right)$$

$$= \lim_{x \to \infty} \frac{\frac{1}{x}}{1} = 0$$

$$y = e^0 = 1$$