1. Find the inverse function in each following case

(a). $f(x) = x^2 + 1 \quad x > 0$

(b). $f(x) = x^2 - 2x + 1 \quad x > 1$

(c). $f(x) = e^{x+2} \quad x > 0$

2. Find the derivatives of each following function

(a). $f(x) = x \cdot \sqrt{\ln x}$

(b). $f(x) = \ln(\ln(\ln x))$

(c). $f(x) = x^x$

(d). $f(x) = \left(\frac{(x-1)(x-2)}{(x-3)(x-4)}\right)^{\frac{1}{3}}$

3. Evaluate the integrals

(a). $\int_{-1}^{0} \frac{2}{x^2 - 5x + 6}\, dx$

(b). $\int \frac{\sec x \, dx}{\sqrt{\ln(\sec x + \tan x)}}$

(c). $\int_0^{\frac{\pi}{2}} \tan\frac{x}{2}\, dx$

(d). $\int \frac{e^{\sqrt{r}}}{\sqrt{r}}\, dr$

4. Prove the inequality:

(a) $x - \frac{x^2}{2} < \ln(1+x) < x - \frac{x^2}{2(1+x)}, \quad x > 0$

(b). $\frac{b-a}{b} < \ln\frac{b}{a} < \frac{b-a}{a} \quad 0 < a < b$