1. What are the domain and range of the function $f(x) = \frac{1}{\ln(9-x)}$?

2. Find $\frac{dy}{dx}$ if $y = \frac{1 - \ln x}{1 + \ln x}$.

3. Use areas to show that $\frac{1}{3} < \ln 1.5 < \frac{5}{12}$.

4. $\int \frac{dx}{x \ln x}$

5. $\int \frac{e^{1/x}}{x^2} \, dx$

6. $\lim_{x \to \pi} \frac{e^{\sin x} - 1}{x - \pi}$

7. Show that $e^x \geq 1 + x$ if $x \geq 0$ (Hint: Show that the difference is increasing).

8. Continuation: Show that $e^x \geq 1 + x + \frac{1}{2}x^2$ for $x \geq 0$.

9. Continuation: Show that $e^x \geq 1 + x + \frac{x^2}{2!} + \cdots + \frac{x^n}{n!}$ for $x \geq 0$ and any positive integer $n$.

10. Continuation: What is $\lim_{x \to \infty} \frac{e^x}{x^n}$ for any positive integer $n$?

11. Find the area of the region bounded by the curves $y = e^x$, $y = e^{-x}$, $x = -2$ and $x = 1$.

12. Find the volume of the solid obtained by rotating about the $y$-axis the region under the curve $y = 1/(1 + x^4)$ from $x = 0$ to $x = 1$.

13. What is the equation of the tangent line to the curve $y = x \ln x$ at the point $(e, e)$?

14. Suppose $\int_0^x f(t) \, dt = xe^{2x} + \int_0^x e^{-t} f(t) \, dt$.

What is $f(x)$?