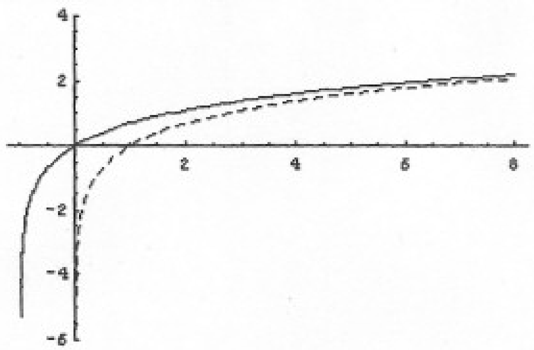
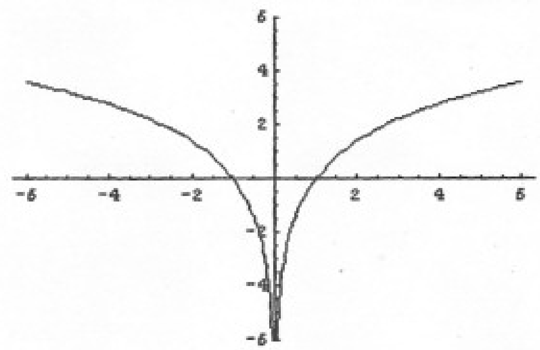
Due 12/15

$\boxed{13.4}$

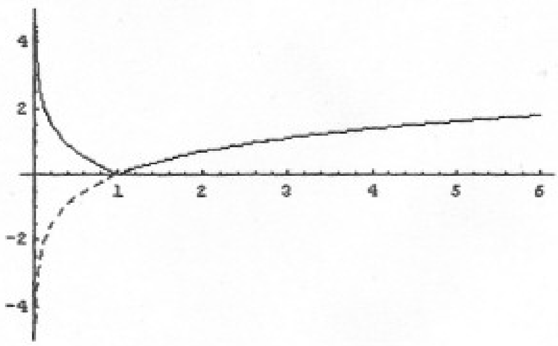
Problem 1.



Problem 2.



Problem 3.



$\boxed{14.1}$

Problem 1.
$y = 2\ln 5x \Rightarrow y = 2(\ln(5) + \ln(x)) \Rightarrow y' = 2(\frac{1}{x}) = \frac{2}{x}$.

Problem 2.
$y = \pi \ln\sqrt{x} \Rightarrow y = \pi(\frac{1}{2})\ln(x) \Rightarrow y' = (\frac{\pi}{2})(\frac{1}{x}) = \frac{\pi}{2x}$.

Problem 3.
$y = \frac{\ln 3x}{5} \Rightarrow y = \frac{1}{5}(\ln(3) + \ln(x)) \Rightarrow y' = \frac{1}{5}(\frac{1}{x}) = \frac{1}{5x}$.

Problem 4.
$y = x\ln x \Rightarrow y' = (1)(\ln(x)) + (x)(\frac{1}{x}) = \ln(x) + 1$.

Problem 5.
$y = \frac{\ln\sqrt{2x}}{x} \Rightarrow y = \frac{\frac{1}{2}\ln(2x)}{x} = \frac{\ln(2)+\ln(x)}{2x} \Rightarrow y' = \frac{(\frac{1}{x})(2x)-(2)(\ln(2)+\ln(x))}{(2x)^2} = \frac{1-(\ln(2)+\ln(x))}{2x^2}$.

Problem 6.
$y = 3\log x \Rightarrow y = 3\frac{\ln x}{\ln 10}$
$y' = \frac{3}{\ln 10}\left(\frac{1}{x}\right) = \frac{3}{x\ln 10}$.

Problem 7.
$y = \frac{\log_2 x}{3} \Rightarrow y = \frac{\ln x}{3\ln 2} \Rightarrow y' = \frac{1}{3\ln 2}(\frac{1}{x}) = \frac{1}{3x\ln 2}$.

Problem 8.
$f(x) = \frac{\ln(\sqrt{3x})}{2} + 3 = \frac{\ln(3x)}{4} + 3 = \frac{\ln(3)+\ln(x)}{4} + 3 = \frac{\ln(x)}{4} + \frac{\ln(3)}{4} + 3 \Rightarrow f'(x) = \frac{1}{4}(\frac{1}{x}) = \frac{1}{4x}$. We see that $f'(x) > 0$ on $(0,\infty)$, which is the domain of f. Thus f is increasing and hence is invertible.

To solve for $f^{-1}(x)$, we have: $x = \frac{\ln(\sqrt{3f^{-1}(x)})}{2} + 3 \Rightarrow 2(x-3) = \ln(\sqrt{3f^{-1}(x)}) \Rightarrow e^{2(x-3)} = \sqrt{3f^{-1}(x)}$
$\Rightarrow (e^{2(x-3)})^2 = 3f^{-1}(x) \Rightarrow f^{-1}(x) = \frac{e^{4(x-3)}}{3}$.

Problem 10.

$f'(x) = \ln(x) + x\frac{1}{x} = \ln(x) + 1 \Rightarrow f'(x) = 0$ when $\ln(x) = -1 \Rightarrow x = \frac{1}{e}$. Now $f'(x)$ is positive on $\left(\frac{1}{e}, \infty\right)$ and is negative on $\left(0, \frac{1}{3}\right)$. Hence, at its only critical point, $x = \frac{1}{e}$, f has a local and absolute minimum value of $f\left(\frac{1}{e}\right) = -\frac{1}{e}$.

pg2

$\boxed{10.1}$

Problem 1.

(a) i.

(b) ii.

(c) Product rule: $f(x) = (\ln x)^2 = (\ln x)(\ln x) \Rightarrow f'(x) = (\ln x)\left(\frac{1}{x}\right) + \left(\frac{1}{x}\right)(\ln x) = \frac{2\ln x}{x}$.
Chain rule: $f(x) = (\ln x)^2 \Rightarrow f'(x) = 2\ln(x)\left(\frac{1}{x}\right) = \frac{2\ln x}{x}$.

(d) Logarithm rules: $f(x) = \ln x^2 = 2\ln x \Rightarrow f'(x) = \frac{2}{x}$.
Chain rule: $f(x) = \ln x^2 \Rightarrow f'(x) = \left(\frac{1}{x^2}\right)(2x) = \frac{2}{x}$.