

NAME, SECTION

- (1) Find the quadratic Taylor polynomial  $p_2(x)$  centered at  $a = e$  for the function  $f(x) = \ln x$ .

$$\begin{aligned}
 f(x) &= \ln x \\
 f'(x) &= \frac{1}{x} \\
 f''(x) &= -\frac{1}{x^2} \\
 p_2(x) &= f(e) + f'(e)(x-e) + \frac{f''(e)}{2}(x-e)^2 \\
 &= \ln e + \frac{1}{e}(x-e) - \frac{1}{2e^2}(x-e)^2 \\
 &= 1 + \frac{1}{e}(x-e) - \frac{1}{2e^2}(x-e)^2
 \end{aligned}$$

- (2) Give the formula for the best-approximating line to the graph of  $f(x) = \ln x$  near  $x = e$ .

$$p_1(x) = 1 + \frac{1}{e}(x-e)$$