Math 17B - UCD Name

No notes or calculators. You can leave an answer as a numerical expression without computing the final value. For example, this is a perfectly acceptable answer : $((250-63)/(1-e^{(-6*3.5)}))*ln(27/168)$. Show your work clearly !!

1. (4 points) Compute the Taylor polynomial of degree $n = 3$ about $a = 1$ for the function $f(x) = ln(x)$.

$f'(x) = \frac{1}{x}$

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

$f'''(x) = \frac{2}{x^3}$

Taylor polynomial :

$\ln(1) + \frac{1}{1!}\left(\frac{1}{1}\right)(x-1) + \frac{1}{2!}\left(\frac{-1}{1^2}\right)(x-1)^2 + \frac{1}{3!}\left(\frac{2}{1^3}\right)(x-1)^3$

$= \boxed{(x-1) - \frac{(x-1)^2}{2} + \frac{(x-1)^3}{3}}$

2. (6 points) Compute the integral.

$$\int_1^e \frac{dx}{x\sqrt{ln(x)}}.$$

$x=1$ is a "problem point" and no other "problem points" in $[1, e]$.

$\therefore \int_z^e \frac{dx}{x\sqrt{\ln x}}$: Need $\int \frac{dx}{x\sqrt{\ln x}}$

1. $u = \ln x$ 2. $\frac{du}{dx} = \frac{1}{x}$ $\Rightarrow du = \frac{1}{x}dx$

3. $\int \frac{1}{\sqrt{u}} du = \frac{u^{1/2}}{1/2} = 2(\ln x)^{1/2}$

$= 2(\ln e)^{1/2} - 2(\ln z)^{1/2}$

$\therefore \lim_{z \to 1} \left[2(\ln e)^{1/2} - 2(\ln z)^{1/2}\right]$

$= \boxed{2}$