Student No: _____
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Signature: _____

Time: March 2, 12:15
Duration: 15 min.
Weight: 10 points
Score: _____

MATH 118 - 2018 Spring
Section-24 Quiz-1

1) Evaluate $\int \frac{dx}{(4+x^2)^{3/2}}$.

2) Evaluate the given integral or show that it diverges: $\int_0^1 \ln x \, dx$.

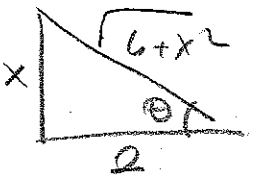
Note: *Show all your work as is done in the lectures.*

ANSWER

1) $\int \frac{dx}{(4+x^2)^{3/2}} = \int \frac{dx}{4^{3/2}\left(1+\left(\frac{x}{2}\right)^2\right)^{3/2}}$ let $x = 2\tan\theta$

$dx = 2\sec^2\theta\, d\theta$

$= \int \frac{2\sec^2\theta\, d\theta}{8(1+\tan^2\theta)^{3/2}} = \frac{1}{4}\int \frac{\sec^2\theta}{\sec^3\theta}\, d\theta$



$= \frac{1}{4}\int \cos\theta\, d\theta = \frac{1}{4}\sin\theta + C$

$= \frac{1}{4}\cdot\frac{x}{\sqrt{4+x^2}} + C$

2) $\int_0^1 \ln x\, dx = \lim_{R\to 0^+}\int_R^1 \ln x\, dx = \lim_{R\to 0^+}\left((x\ln x)\Big|_R^1 - \int_R^1 dx\right)$

$u = \ln x \quad du = \frac{1}{x}dx$

$dv = dx \quad v = x$

$= \lim_{R\to 0^+}\left((0 - R\ln R) - x\Big|_R^1\right) = \lim_{R\to 0^+}(-R\ln R - (1-R))$

$= 0 - 1 + 0 = -1$

$\lim_{R\to 0^+} R\ln R = \lim_{R\to 0^+}\frac{\ln R}{1/R} \overset{\infty/\infty}{=}$

$\overset{\text{LH}}{=} \lim_{R\to 0^+}\frac{1/R}{-1/R^2} = \lim_{R\to 0^+} -R = 0$