

Math 112

Quiz 1

Wednesday, January 23, 2008

Solutions

1. Evaluate $\lim_{x \rightarrow 1} \frac{\ln x}{x^2 - x} = \frac{0}{0} \stackrel{\text{L}}{=} \lim_{x \rightarrow 1} \frac{\frac{1}{x}}{2x-1}$

$$= \boxed{1}$$

2. Evaluate $\int \frac{\sqrt{1+1/x}}{x^2} dx$. $u = 1 + \frac{1}{x}$ $du = -\frac{1}{x^2} dx$

$$= \int -\sqrt{u} du = -\int u^{1/2} du \quad -du = \frac{1}{x^2} dx$$

$$= -\frac{2}{3} u^{3/2} + C = \boxed{-\frac{2}{3} \left(1 + \frac{1}{x}\right)^{3/2} + C}$$

3. Evaluate $\int_0^{\pi} \sin^3 x \cos x \, dx$.

$$u = \sin x \quad du = \cos x \, dx$$

$$x=0 \quad x=\pi$$

$$u=0 \quad u=0$$

$$= \int_0^0 u^3 \, du = \boxed{0}$$

4. Evaluate $\int x^2 e^x \, dx$.

$$u = x^2 \quad dv = e^x \, dx$$

$$du = 2x \, dx \quad v = e^x$$

$$\int x^2 e^x \, dx = x^2 e^x - \int 2x e^x \, dx$$

$$u = 2x \quad dv = e^x \, dx$$

$$du = 2 \, dx \quad v = e^x$$

$$= x^2 e^x - [2x e^x - \int 2e^x \, dx]$$

$$= \boxed{x^2 e^x - 2x e^x + 2e^x + C}$$