1 Math 215 Homwork 5 Question 3

Evaluate as an infinite series

$$\int \frac{e^x}{x} dx \tag{1}$$

using a Taylor Expansion on e^x:

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

$$= \int (\frac{1}{x} + 1 + \frac{x}{2!} + \frac{x^2}{3!} + \frac{x^3}{4!}....)dx \tag{3}$$

$$= \int \frac{1}{x} dx + \int dx + \int \frac{x}{2!} dx + \int \frac{x^2}{3!} dx + \int \frac{x^3}{4!} dx.... \tag{4}$$

$$= C + ln|x| + \frac{x^2}{2 \cdot 2!} + \frac{x^3}{3 \cdot 3!} + \frac{x^4}{4 \cdot 4!}.... \tag{5}$$

$$= C + ln|x| + \sum \frac{x^n}{n!} \tag{6}$$

Q.E.D