

Math 1B: Quiz 1

THERE ARE TWO SIDES TO THIS QUIZ. NO CALCULATORS ARE ALLOWED. JUSTIFY YOUR ANSWERS APPROPRIATELY.

1. Find $\int_0^1 x^2 e^x dx$

$$u = x^2$$

$$dv = e^x dx$$

$$du = 2x dx$$

$$v = e^x$$

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

$$x^2 e^x - 2(x e^x - e^x) \Big|_0^1$$

$$e - 2(e - e) - (0 - 2(0 - 1))$$

$$= \boxed{e - 2}$$

2. Find $\int \sin^3 x \cos^2 x dx$

$$= \int \sin x (1 - \cos^2 x) \cos^2 x dx$$

$$u = \cos x$$

$$du = -\sin x dx$$

$$= - \int (1 - u^2) u^2 du$$

$$= \int -u^2 + u^4 du$$

$$= -\frac{u^3}{3} + \frac{u^5}{5} = \boxed{-\frac{\cos^3 x}{3} + \frac{\cos^5 x}{5} + C}$$

$$3. \text{ Find } \int \tan^3 x \, dx = \int (\sec^2 x - 1) \tan x \, dx.$$

$$= \int \sec^2 x \tan x \, dx - \int \tan x \, dx.$$

$$= \frac{\tan^2 x}{2} - \int \tan x \, dx.$$

$$\int \tan x \, dx = -\ln |\cos x| + C.$$

$$= \boxed{\frac{\tan^2 x}{2} + \ln |\cos x| + C}$$