

## Quiz 1 Solution

1. Find the following integrals.

(a) (5 points)  $\int x^2(\ln x)dx$

**Solution:** Let  $u = \ln x$  and  $dv = x^2dx$ . Then,  $du = \frac{dx}{x}$  and  $v = \frac{x^3}{3}$ . So, the integral becomes

$$\int x^2(\ln x)dx = uv - \int vdu = \frac{x^3}{3} \ln x - \int \frac{x^2}{3}dx = \frac{x^3}{3} \ln x - \frac{x^3}{9} + C$$

(b) (5 points)  $\int t^3 \sin(t^2)dt$

**Solution:** Let  $s = t^2$ . Then,  $ds = 2tdt$ , so

$$\frac{1}{2} \int s \sin(s)ds$$

Now, we do integration by parts. Let  $u = s$  and  $dv = \sin sds$ . Then,  $du = ds$  and  $v = -\cos s$ . So, the integral becomes

$$\frac{1}{2} \int s \sin sds = \frac{1}{2} \left[ -s \cos s + \int \cos s ds \right] = \frac{1}{2} [-t^2 \cos(t^2) + \sin(t^2)] + C$$