

Instructions: You must show all work to receive full credit for the problems below. You may check your work with a calculator, but answers without work will receive minimal credit. Use exact answers unless the problem starts with decimals or you are specifically asked to round.

1. Integrate.

a. $\int \frac{(\ln x)^5}{x} + \frac{1}{x \ln x} dx$ $u = \ln x \quad du = \frac{1}{x}$

$$\int u^5 + \frac{1}{u} du = \frac{1}{6} u^6 + \ln u + C$$

$$\frac{1}{6} (\ln x)^6 + \ln(\ln x) + C$$

b. $\int t^3 e^{-t^4} dt$ $u = -t^4$
 $\frac{-1}{4} du = t^3 dt$

$$\int -\frac{1}{4} e^u du = -\frac{1}{4} e^{-t^4} + C$$

c. $\int 9x e^{-4x} dx$ $u = 9x \quad du = 9 dx$
 $dv = e^{-4x} dx \quad v = -\frac{1}{4} e^{-4x}$

$$-\frac{9}{4} x e^{-4x} + \frac{9}{4} \int e^{-4x} dx = -\frac{9}{4} x e^{-4x} - \frac{9}{16} e^{-4x} + C$$

d. $\int x^3 \ln 2x dx$ $u = \ln 2x \quad dv = x^3 dx$
 $du = \frac{1}{x} dx \quad v = \frac{1}{4} x^4$

$$\frac{1}{4} x^4 \ln 2x - \int \frac{1}{4} x^3 dx = \frac{1}{4} x^4 \ln 2x - \frac{1}{16} x^4 + C$$