

# Quiz 5

*Key*

Show *all* your work. Reasonable supporting work must be shown for any partial credit.

1. [2] Write down the integration by parts formula. That is, complete the equation below:

*Start 4.5*  
*Notation 1.5*

$$\int u \, dv = \underline{uv} - \underline{\int v \, du}$$

1.5      1.5

2. For each of the following, identify the technique you would use to find the indefinite integral. For example, if you think substitution would work, write "substitution" and identify what  $u$  would be. If you think integration by parts, write "integration by parts" and identify what  $u$  and  $dv$  would be.

(a) [2] (WebHW7-1#4) *try IP & give up*  
*Start 1.5*      *+ 5 marks*      *+ 5 marks*  
*Substitution* :  $u = 1 + \cos(t)$   
 $du = -\sin(t) dt$

$$\int \sin(t) \sqrt{1 + \cos(t)} dt = \int \sqrt{\underbrace{1 + \cos(t)}_{u}} \underbrace{\sin(t)}_{-du} dt$$

$$= \int \sqrt{u} - du$$

- (b) [2] (Week5MondayActivity#2)

*Substitution + 5*  
*Start 1.5*      *+ 1*  
*Integration by parts twice*

$$\int \frac{(\ln(x))^2}{x^2} dx = -(\ln(x))^2 x^{-1} - \int -x^{-1} 2\ln(x) \frac{1}{x} dx$$

$$u = (\ln(x))^2 \quad v = -x^{-1}$$

$$du = 2\ln(x) \frac{1}{x} dx \quad dv = \frac{1}{x^2} dx$$

3. [4] Evaluate one of the indefinite integrals above.

2 a)  $\int \sin(t) \sqrt{1 + \cos(t)} dt = \int \sqrt{u} (-1) du$   
 $u = 1 + \cos(t)$   
 $du = -\sin(t) dt$   
 $(-1) du = \sin(t) dt$

$$= -\int u^{\frac{1}{2}} du$$

$$= -\frac{2}{3} u^{\frac{3}{2}} + C$$

$$= -\frac{2}{3} (1 + \cos(t))^{\frac{3}{2}} + C$$

*Notation 1.5*  
*Start 1.5*

tried something correctly  $\frac{+2}{+2}$  might have worked  
 $+C$  *(1.5)*  
*got it! (1.5)*

2 b)  $\int \frac{(\ln(x))^2}{x^2} dx = -x^{-1} (\ln(x))^2 - \int -x^{-1} 2\ln(x) \frac{1}{x} dx$   
 $u = (\ln(x))^2 \quad v = -x^{-1}$   
 $du = 2\ln(x) \frac{1}{x} dx \quad dv = x^{-2} dx$   
 $= -x^{-1} (\ln(x))^2 + 2 \int \frac{\ln(x)}{x^2} dx$   
 $u = \ln(x) \quad v = -x^{-1}$   
 $du = \frac{1}{x} dx \quad dv = x^{-2} dx$   
 $= -x^{-1} (\ln(x))^2 + 2 \left[ \ln(x) x^{-1} - \int -x^{-1} \frac{1}{x} dx \right]$   
 $= -x^{-1} (\ln(x))^2 - \frac{2}{x} \ln(x) + 2 \int \frac{1}{x^2} dx$   
 $= -x^{-1} (\ln(x))^2 - \frac{2}{x} \ln(x) + 2 (-1) x^{-1} + C$