

Recitation Handout 1(b): The technique of u-Substitution

Find an equation for each of the anti-derivatives (or indefinite integrals) given in the table below. In each case, identify the “inside function” (u), calculate the derivative $\frac{du}{dx}$ and rewrite the indefinite integral in terms of u and du .

<i>Anti-derivative (Indefinite integral)</i>	<i>Work and equation for Anti-derivative</i>
$\int \ln(x) \cdot \sqrt{x \cdot \ln(x) - x} \cdot dx$	
$\int \left(\frac{-1}{x^2} + 2x\right) \cdot \sqrt{\frac{1}{x} + x^2 + 1} \cdot dx$	

Answers: (a) $(2/3) \cdot [x \cdot \ln(x) - x]^{3/2} + C$. (b) $(2/3) \cdot [1/x + x^2 + 1]^{3/2} + C$.
 (c) $2 \cdot [x \cdot \ln(x)]^{1/2} + C$. (d) $(1/15) \cdot [x + \ln(x)]^{15} + C$. (e) $\ln(\ln(x)) + C$.

Anti-derivative (Indefinite integral)	Work and equation for Anti-derivative
$\int (\ln(x) + 1) \cdot \frac{1}{\sqrt{x \cdot \ln(x)}} \cdot dx$	
$\int \left(\frac{x+1}{x}\right) \cdot (x + \ln(x))^{14} \cdot dx$	
$\int \frac{1}{\ln(x)} \cdot \frac{1}{x} \cdot dx$	

Answers: (a) $(2/3) \cdot [x \cdot \ln(x) - x]^{3/2} + C$. (b) $(2/3) \cdot [1/x + x^2 + 1]^{3/2} + C$.
(c) $2 \cdot [x \cdot \ln(x)]^{1/2} + C$. (d) $(1/15) \cdot [x + \ln(x)]^{15} + C$. (e) $\ln(\ln(x)) + C$.