MATH 242 - WS4

02/01/2024

1. Evaluate each integral using IBP:

   (a) $\int \ln(x^{x^2-3x})dx$ $= \int (x^2-3x)\ln(x)$

$u = \ln(x)$	$dv = (x^2-3x)dx$
$du = \frac{1}{x}dx$	$v = \frac{x^3}{3} - \frac{3x^2}{2}$

$$= \left(\frac{x^3}{3} - \frac{3x^2}{2}\right)\ln(x) - \int\left(\frac{x^2}{3} - \frac{3x}{2}\right)dx$$

$$= \boxed{\left(\frac{x^3}{3} - \frac{3x^2}{2}\right)\ln(x) - \frac{x^3}{9} + \frac{3x^2}{4} + C}$$

   (b) $\int x^2 \sin(3x)dx$

$u = x^2$	$dv = \sin(3x)dx$
$2x$	+ $-\frac{1}{3}\cos(3x)$
2	− $-\frac{1}{9}\sin(3x)$
	+
0	− $\frac{1}{27}\cos(3x)$

$$= \boxed{-\frac{x^2}{3}\cos(3x) + \frac{2x}{9}\sin(3x) + \frac{2}{27}\cos(3x) + C}$$

Note: $[xe^x - e^x]' = e^x + xe^x - e^x = xe^x$

(in class) we found by IBP

(c) $\int_0^1 e^{\sqrt{x}} dx$ (Hint: first take a u-substitution $t = \sqrt{x}$)

$t = \sqrt{x}$

$dt = \frac{1}{2\sqrt{x}} dx$

$\underbrace{2\sqrt{x}}_{= 2t}\, dt = dx$

$2\int_0^1 te^t \, dt$

$= 2\left(te^t - e^t\right)\Big|_{t=0}^{1}$

$= 2\left((e - e) - (0 - 1)\right) = \boxed{2}$