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DEPT: CHEMICAL ENGINEERING

MAT 104 ASSIGNMENT

Integrate the following with respect to their variable

1. 3te2t

2. x2sinx

3. sin7xcos2x

4. (2x-3x2) / 1-x

SOLUTION:

1. 3te2t ⇒ 3∫ te2t

Integration by parts: ∫udv=uv−∫vdu

u = t ⇒ = 1 ⇒ du=dt

dv= e2t ⇒ ∫dv=∫e2tdt

⇒ let u= 2t ⇒ = 2 ⇒ dt =

⇒ v =∫eu. ⇒ ∫eu. du ⇒ ∫eu du ⇒ ∫eu ⇒  **e2t**

⇒ (t). ( e2t) - ∫ e2t. dt ⇒ t e2t - ∫e2t

⇒ t e2t - ( e2t) ⇒3[ t e2t - e2t]

⇒ **t e2t - e2t + C**

2. x2sinx

Integration by parts: ∫udv=uv−∫vdu

u=x2 ⇒ =2x ⇒ du=2xdx

dv=sin(x)dx ⇒ ∫dv=∫sin(x)dx ⇒ v=−cos(x)

Thus, substituting these into the integration by parts formula, we see that:

∫ x2sin(x)dx= − x2cos(x)−∫(−2xcos(x)) dx

∫ x2sin(x)dx= − x2cos(x)+2∫xcos(x)dx

Now, do integration by parts once more on the remaining integral:

u=x ⇒ =1 ⇒ du=dx

dv=cos(x)dx ⇒ ∫dv=∫cos(x)dx ⇒ v=sin(x)

Thus:

∫xcos(x)dx=xsin(x)−∫sin(x)dx

Since ∫sin(x)dx=−cos(x), this becomes:

∫xcos(x)dx=xsin(x)+cos(x)

Therefore:

∫ x2sin(x)dx=−x2cos(x)+2∫xcos(x)dx

Substitute in ∫xcos(x)dx=xsin(x)+cos(x):

∫ x2sin(x)dx=−x2cos(x)+2(xsin(x)+cos(x))

 **= −x2cos(x)+2xsin(x)+2cos(x)+C**

3. sin7xcos2x

= ∫[sin(7x+4x) +sin(7x−4x)] dx

= ∫[sin(11x) +sin(3x)] dx

= [∫sin(11x) +∫sin(3x) dx]

= [ − ]+C

**= +C**

4. (2x-3x2) / 1-x

Rearranging gives

Then divide (-3x2 +2x) by (-x+1) and integrate

 3x +1

 -x+1 -3x2+2x

 -3x2+3x

 -x

 -x+1

 1

Therefore,

= -

= + x – ln(-x+1) +c