Spring2021
MAT120
ASSIGNMENT-04

April 8, 2021

Name:Nur-E-Jannat
Student ID:20210002
Section:07
Set:11

1. $\int_0^4 \int_0^x \sqrt{1+x^2} dy dx$

$$= \int_0^4 x\sqrt{x^2+1} dx$$

Let,

$$\begin{aligned} z &= \sqrt{1+x^2} \\ \Rightarrow z^2 &= 1+x^2 \\ \Rightarrow dz \ \ 2z &= 2x dx \\ \Rightarrow x dx &= z dz \end{aligned}$$

changing the limit,

x	0	4
z	1	$\sqrt{17}$

By substituting, $\int_0^{\sqrt{17}} u^2 \cdot du$

$= \left[\frac{u^3}{3}\right]_0^{\sqrt{17}}$

$= \frac{17\sqrt{17}-1}{3}$

2. Given that, $x^2 + y^2 = a^2$

$\Rightarrow y = \sqrt{a^2 - x^2}$

Area of the circle, A

$= 4 \int_0^a \int_0^{\sqrt{a^2-x^2}} dydx$

$= 4 \int_0^a [y]_0^{\sqrt{a^2-x^2}} dx$

$= 4 \int_0^a \sqrt{a^2 - x^2} dx$

$= 4 \left[\frac{x}{2}\sqrt{a^2 - x^2} + \frac{a^2}{2} \sin^{-1} \frac{x}{a}\right]_0^a$

$= \pi a^2$

3. $\int_0^1 \int_0^1 (x+y) dx dy$

$= \int_0^1 \left[\frac{x^2}{2} + yx\right]_0^1 dy$

$= \int_0^1 \left(\frac{1}{2} + y\right) dy$

$= \left[\frac{y}{2} + \frac{y^2}{2}\right]_0^1$

$= 1$

$4. Given that,$
$y = 4 - x^2$
$y = x^2 - 4$
$x^2 - 4 = 4 - x^2$
$\Rightarrow 2x^2 = 8$
$x = \pm 2$
$A = \int_{-2}^{+2} \int_{4-x^2}^{x^2-4} dydx$

$= \int_{-2}^{2} [y]_{4-x^2}^{x^2-4} dx$

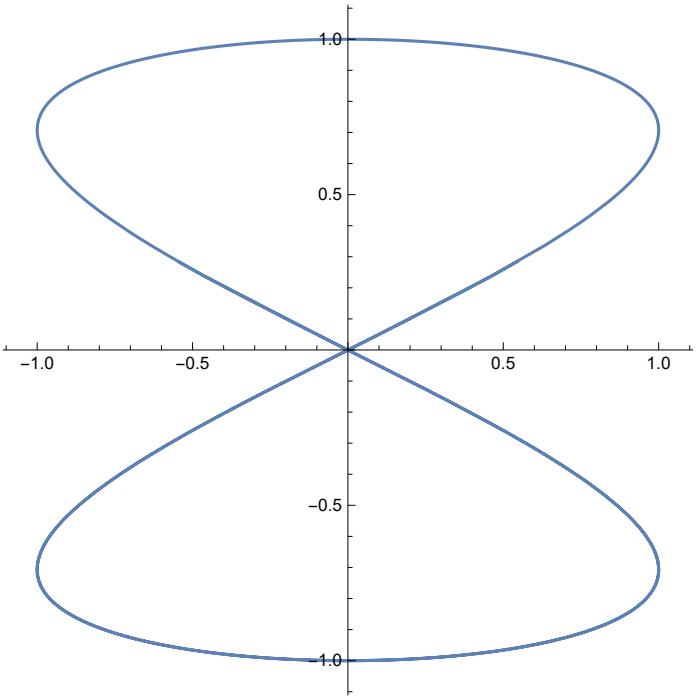
$= \int_{-2}^{2} \left(2x^2 - 8\right) dx$

$= \left[2 \cdot \frac{x^3}{3} - 8x\right]_{-2}^{+2}$
$= \frac{-64}{3}$

5.a)

In[•]:=
```
ParametricPlot[{Sin[2 t], Cos[t]}, {t, -5, 5}]
```

Out[•]=



b)

In[•]:=
```
D[Sin[2 t], t]
D[Cos[t], t]
```

Out[•]= $2\,\text{Cos}[2\,t]$

Out[•]= $-\text{Sin}[t]$

In[•]:=
$$L = \int_0^4 \sqrt{\left(2\,\text{Cos}[2\,t]\right)^2 + \left(-\text{Sin}[t]\right)^2}\, dt \;//\; N$$

Out[•]= 5.8711

c)

In[•]:= **ParametricPlot3D[{Cos[t], Sin[t], Cos[2 t]}, {t, 4, 12}]**

Out[•]=