

Calculus, 2019-1-IE-2

Name:

Sequence Number:

1°). Evaluate the following Integrations: (total 100%, each 10% (~~x~~10))

a°). $\int_0^1 \exp\left(\frac{x}{3}\right) dx$

b°). $\int_0^{\pi/2} \sin x \cos^2 x dx$

c°). $\int_0^{\pi/2} \cos^2 2x dx$

d°). $\int_0^1 \frac{1}{e^x + e^{-x}} dx$

e°). $\int_0^1 e^x \cos 3x dx$

f°). $\int_0^{\pi/2} \tan \frac{x}{2} dx$

g°). $\int_0^{1/2} \sqrt{1-x^2} dx$

h°). $\int_{-1}^0 \frac{1}{x^2+2x+2} dx$

i°). $\int_{-\pi/3}^{\pi/3} \sin 4x \sin 5x dx$

j°). $\int_1^2 \frac{-3-x}{x+x^2} dx$

2°). (total 10%) Describe what the Fundamental Theorem of Calculus is and evaluate the derivative

$$\frac{d}{dx} \int_0^{x^2} \sqrt{t} e^{-t} dt$$

1 Answer

In [3]: 1 `from sympy import *`

In [4]: 1 `x,t,u,C =symbols("x t u C")`

In [1]: 1 `from sympy import exp,sin,cos,tan,pi`
2 `from mpmath import e`

In [2]: 1 `def Int(f,*args):`
2 `if(len(args)!=0):`
3 `a=args[0]`
4 `b=args[1]`
5 `print(" ",b)`
6 `print("The definite integral of ∫ %s dx"`
7 `print(" ",a)`
8 `pprint(integrate(f,(x,a,b)))`
9 `else:`
10 `print("The indefinite integral of ∫ %s"`
11 `pprint(integrate(f,x)+C)`

In [5]: 1 `#1.a)`
2 `Int(exp(x/3),0, 1)`

The definite integral of $\int_0^1 \exp(x/3) dx$ is

$$-3 + 3 \cdot e^{1/3}$$

In [7]:

```
1 #1.b)
2 Int((sin(x))*cos(x)**2,0,pi/2)
```

The definite integral of $\int_0^{\pi/2} \sin(x) \cos(x) dx$ is
 $\frac{1}{3}$

In [10]:

```
1 # 1. c)
2 Int(cos(2*x)**2,0,pi/2)
```

The definite integral of $\int_0^{\pi/2} \cos(2x) dx$ is
 $\frac{\pi}{4}$

In [15]:

```
1 #1.d)
2 Int(1/(x**2+1),1,e)
```

The definite integral of $\int_1^{2.71828182845905} \frac{1}{x^2 + 1} dx$ is
 $1.21828290501728 - \frac{\pi}{4}$

In [5]:

```
1 #1. e)
2 Int(exp(x)*cos(3*x),0,1)
```

The definite integral of $\int_0^1 \exp(x) \cos(3x) dx$ is
 $\frac{e \cdot \cos(3)}{10} - \frac{1}{10} + \frac{3 \cdot e \cdot \sin(3)}{10}$

In [6]:

```
1 #1. f)
2 Int(tan(x/2),0,pi/2)
```

The definite integral of $\int_0^{\pi/2} \tan(x/2) dx$ is
 $-2 \cdot \log\left(\frac{\sqrt{2}}{2}\right)$

In [9]:

| | |
|---|---------------------------|
| ▼ | 1 #1. g) |
| | 2 Int(sqrt(1-x**2),0,1/2) |

$$\int_0^{0.5} \sqrt{1 - x^2} \, dx$$
 The definite integral of $\int_0^{0.5} \sqrt{1 - x^2} \, dx$ is
 0.478305738745259

In [10]:

| | |
|---|----------------------------|
| ▼ | 1 #1. h) |
| | 2 Int(1/(x**2+2*x+2),-1,0) |

$$\int_{-1}^0 \frac{1}{x^2 + 2x + 2} \, dx$$
 The definite integral of $\int_{-1}^0 \frac{1}{x^2 + 2x + 2} \, dx$ is
 $-\frac{\pi}{4}$

In [11]:

| | |
|---|-------------------------------------|
| ▼ | 1 #1. i) |
| | 2 Int(sin(4*x)*sin(5*x),-pi/3,pi/3) |

$$\int_{-\pi/3}^{\pi/3} \sin(4x) \sin(5x) \, dx$$
 The definite integral of $\int_{-\pi/3}^{\pi/3} \sin(4x) \sin(5x) \, dx$ is
 $\frac{\sqrt{3}}{2}$

In [12]:

| | |
|---|----------------------------|
| ▼ | 1 #1. j) |
| | 2 Int((-x-3)/(x+x**2),1,2) |

$$\int_1^2 \frac{-x - 3}{x^2 + x} \, dx$$
 The definite integral of $\int_1^2 \frac{-x - 3}{x^2 + x} \, dx$ is
 $-5 \cdot \log(2) + 2 \cdot \log(3)$

In []:

| |
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| 1 |
|---|

In [13]:

| | |
|---|---|
| ▼ | 1 #2. |
| | 2 |
| | 3 diff(integrate((sqrt(t)*exp(-t)),(t,0,x**2)),x) |

Out[13]: $2x\sqrt{x^2}e^{-x^2}$

In []:

| |
|---|
| 1 |
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