

MATLAB

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Lecture 19

(49)

Finding the Indefinite Integral of a Function in MATLAB prog.

Example (1): Find the indefinite integral of the function $g(x) = \sin x$ in MATLAB prog. (or Find $\int \sin x dx$ in MATLAB prog.)

Answer:

```
>> syms x ↵  
>> g = sin(x); ↵  
>> int(g) ↵  
ans =  
    -cos(x)
```

Example (2): Find $\int (x^2 + x + 2) dx$ in MATLAB prog.

Answer:

```
>> syms x ↵  
>> y = x^2 + x + 2; ↵  
>> int(y) ↵  
ans =  
(x*(2*x^2 + 3*x + 12))/6
```

Example (3): Find $\int \sqrt{x} dx$ in MATLAB prog.

Answer:

```
>> syms x ↵  
>> f = sqrt(x); ↵  
>> int(f) ↵  
ans =  
(2*x^(3/2))/3
```

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Example (4): Find $\int \frac{1}{t+2} dt$ in MATLAB prog.

Answer:

```
>> syms t <|  
>> y = 1/(t+2) ; <|  
>> int(y) <|  
ans =  
    log(t+2)
```

Finding the Definite Integral of a Function in MATLAB prog.

Example (1): Find $\int_0^1 e^t dt$ in MATLAB prog.

Answer:

```
>> syms t <|  
>> h = exp(t) ; <|  
>> int(h, 0, 1) <|  
ans =  
    exp(1) - 1
```

Example (2): Find $\int_{-1}^2 (x+2) dx$ in MATLAB prog.

Answer:

```
>> syms x <|  
>> y = x+2 ; <|  
>> int(y, -1, 2) <|  
ans =  
    15/2
```

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Example (3): Find $\int_0^4 \sqrt{x} dx$ in MATLAB prog.

Answer:

```
>> syms x ↵  
>> y = sqrt(x); ↵  
>> int(y, 0, 4) ↵  
ans =  
16/3
```

Example (4): Find $\int_0^{10} \frac{1}{t+2} dt$ in MATLAB prog.

Answer:

```
>> syms t ↵  
>> y = 1/(t+2); ↵  
>> int(y, 0, 10) ↵  
ans =  
log(6)
```

Exercises: Find each of the following in MATLAB prog.:

1) $\int \cos x dx$

2) $\int_{-1}^1 (x^2 + 4x + 1) dx$

3) $\int (e^x + x) dx$

4) $\int_0^2 (\tan x + \sqrt{x}) dx$

Lecture 20

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Finding the Limit of a Function in MATLAB prog.

1) Finding the limit of a function $f(x)$ at $x \rightarrow 0$:

Example (1): Find $\lim_{x \rightarrow 0} \frac{1}{x+1}$ in MATLAB prog.

Answer:

```
>> syms x ↵  
>> y = 1/(x+1); ↵  
>> limit(y) ↵  
ans =  
1
```

Example (2): Find $\lim_{x \rightarrow 0} \cos x$ in MATLAB prog.

Answer:

```
>> syms x ↵  
>> y = cos(x); ↵  
>> limit(y) ↵  
ans =  
1
```

Example (3): Find $\lim_{x \rightarrow 0} \frac{7}{x^2-1}$ in MATLAB prog.

Answer:

```
>> syms x ↵  
>> y = 7/(x^2-1); ↵  
>> limit(y) ↵  
ans =  
-7
```

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2) Finding the limit of a function $f(x)$ at $x \rightarrow a$:

Example (1) : Find $\lim_{x \rightarrow 2} \frac{1}{x+3}$ in MATLAB prog.

Answer :

```
>> syms x  
>> y = 1/(x+3);  
>> limit(y, 2)  
ans =  
1/5
```

Example (2) : Find $\lim_{x \rightarrow 1} (x^2 + 3x - 1)$ in MATLAB prog.

Answer :

```
>> syms x  
>> y = x^2 + 3*x - 1;  
>> limit(y, 1)  
ans =  
3
```

Example (3) : Find $\lim_{x \rightarrow 5} \cos x$ in MATLAB prog.

Answer :

```
>> syms x  
>> y = cos(x);  
>> limit(y, 5)  
ans =  
cos(5)
```

Exercises : Find each of the following in MATLAB prog.

1) $\lim_{x \rightarrow 0} \frac{x^2 + 9}{x + 6}$ (ans. = 3/2) 2) $\lim_{x \rightarrow 1} \frac{(x+1)^2}{x+6}$ (ans. = 4/7)

Lecture 21

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Finding the Sum of Finite Terms in MATLAB prog.Example (1): Find the sum of the numbers from 1 to 9 in MATLAB prog.Answer:

>> syms x ↵

>> symsum(x, 1, 9) ↵

ans = 45

Example (2): Find $\sum_{t=1}^6 \frac{1}{t}$ in MATLAB prog.Answer:

>> syms t ↵

>> symsum(1/t, 1, 6) ↵

ans = 49/20

Example (3): Find $\sum_{x=1}^3 \frac{x+1}{2}$ in MATLAB prog.Answer:

>> syms x ↵

>> symsum((x+1)/2, 1, 3) ↵

ans = 9/2

Exercises: Find each of the following in MATLAB prog.

1) $\sum_{x=1}^{100} x$ (ans. = 5050)

3) $\sum_{t=1}^5 t^2$ (ans. = 55)

2) $\sum_{r=1}^4 \frac{1}{r+1}$ (ans. = 77/60)

4) $\sum_{x=10}^{15} (x+1)$ (ans. = 81)

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Simplifying a Function in MATLAB prog.

Example (1): Simplify the function

$$f(x) = 2x^2 - 5x - 4x^2 + 3x - 44 \quad \text{in MATLAB prog.}$$

Answer:

```
>> syms x ↵
```

```
>> f = 2*x^2 - 5*x - 4*x^2 + 3*x - 44 ; ↵
```

```
>> simplify(f) ↵
```

```
ans =  
-2*x^2 - 2*x - 44
```

Example (2): Simplify the function

$$y = \sin x + 3\cos x + 2x^2 + 2\sin x - \cos x + 3x^2 \quad \text{in MATLAB prog.}$$

Answer:

```
>> syms x ↵
```

```
>> y = sin(x) + 3*cos(x) + 2*x^2 + 2*sin(x) - cos(x) + 3*x^2 ; ↵
```

```
>> simplify(y) ↵
```

```
ans =  
3*sin(x) + 2*cos(x) + 5*x^2
```