Solution of Laboratory Work 7

Exercise 1:

```
//Define symbolic variables "u", "v" and form the
//expression "(u + v)^2":
-->syms u v;

-->expr = (u + v)^2

expr =

u^2 + 2*u*v + v^2

// Evaluate the expression x^2 + 2*x + 1" for x = -1:

-->syms x;

-->expr = x^2 + 2*x + 1;

-->subs(expr, x, -1)

ans =

     0

// Simplify (x + 1)^2 - x^2 - 2*x - 1:

-->syms x

-->expr = (x + 1)^2 - x^2 - 2*x - 1;

-->simple(expr)

ans:

    0
```

Exercise 2:

```
// Expand (x - 3)^2 * (x + 2):

-->syms x

-->expr = (x - 3)^2 * (x + 2);

-->expand(expr)

ans:

 x^3 - 4*x^2 - 3*x + 18

//Define g(x) = x^4 - 2*x^2 + 1 and compute g(1) and
// g(-1)

-->syms x

-->g = x^4 - 2*x^2 + 1;

-->subs(g, x, 1)

ans:

 0

-->subst(g, x, -1)

ans:

 0

// Substitute y = 2*x in x + y^2:

-->syms x y

-->expr = x + y^2;

-->subs(expr, y, 2*x)

ans:

x + (2*x)^2 = x + 4*x^2
```

Exercise 3:

```
// Derivatives of  f(x) = x^3 - 4*x + 6:
-->syms x

-->f = x^3 - 4*x + 6;

-->diff(f, x)

ans:

3*x^2 - 4

-->diff(f, x, 2)

ans=

  6*x

//Partial derivatives of  f(x, y) = x*y^2 + log(x):

-->syms x y

-->f = x*y^2 + log(x);

-->diff(f, x)

ans;

y^2 + 1/x

-->diff(f, y)

ans=

2*x*y
```

// Evaluate $\int_0^1 \frac{1}{1+x^2} dx$:

```
-->syms x

-->integrate(1/(1 + x^2), x, 0, 1)

ans: %pi/4
```

Exercise 4:

```
// 1. 4th-order Taylor expansion of "cos(x)" around 0:
-->syms x

-->taylor(cos(x), x, 0, 4)

ans:

1 - x^2/2 + x^4/24

// Taylor expansion of exp(x)around 0 up to degree 5:

-->syms x

-->taylor(exp(x), x, 0, 5)

ans:

 1 + x + x^2/2 + x^3/6 + x^4/24 + x^5/120
```