1.

```
syms x
f = -3*x^3*exp(x^2)*sin(x);
slope = limit((f - subs(f, x, 1)) / (x - 1), x, 1);
disp(slope);
f = cos(x+exp(x))*sin(x);
slope = limit((f - subs(f, x, 1)) / (x - 1), x, 1);
disp(slope);
f =    cos(exp(cos(x)))*sin(x);
slope = limit((f - subs(f, x, 1)) / (x - 1), x, 1);
disp(slope);
f =    -cos(x)*(sin(x)-3*x^3);
slope = limit((f - subs(f, x, 1)) / (x - 1), x, 1);
disp(slope);
f =    -exp(-x)*sin(x)*(3*x^3+x^2);
slope = limit((f - subs(f, x, 1)) / (x - 1), x, 1);
disp(slope);
```

2.

```
f = cos(1/x)*sin(1/x);
lim_value = limit(f, x, 0);
disp(lim_value);
f = piecewise(x ~= 1, -(x - x^2) / (x^2 - 1), x == 1, 0);
lim_value = limit(f, x, 1);
disp(lim_value);
f = (abs(x)^5)/abs(cos(x));
lim_value = limit(f, x, 1);
disp(lim_value);
f = x*exp(3*x)*(x^5-2);
df = diff(f, x);
lim_value = limit(df, x, 0);
disp(lim_value);
f =    cos(1/x)*sin(1/x);
df = diff(f, x);
lim_value = limit(df, x, 1);
disp(lim_value);
```

3.

```
f = -3*x^3*sin(x);
slope = limit((f - subs(f, x, 1)) / (x - 1), x, 1);
```

```
disp(slope);
f = -exp(-x)*sin(x)*(3*x^3+x^2);
slope = limit((f - subs(f, x, 1)) / (x - 1), x, 1);
disp(slope);
f = 3*x^2*exp(-x);
slope = limit((f - subs(f, x, 1)) / (x - 1), x, 1);
disp(slope);
f = -(sin(x)*(3*x^3+x^2))/(x+1);
slope = limit((f - subs(f, x, 1)) / (x - 1), x, 1);
disp(slope);
f =    -(sin(x)*(3*x^3+x^2))/(x^2+1);
slope = limit((f - subs(f, x, 1)) / (x - 1), x, 1);
disp(slope);
```

4.

```
f =    (cos(x-1)*exp(1/x^2))/cos(x);
df = diff(f, x);
disp(df);
f =    x*cot(x-1)*exp(x^2);
df = diff(f, x);
disp(df);
f =    tan(x-1)*exp(x^2)*cos(x);
df = diff(f, x);
disp(df);
f =    (x*exp(x^2))/cos(x-1);
df = diff(f, x);
disp(df);
f =    2*x*sin(x-1)*exp(x^2);
df = diff(f, x);
disp(df);
```

5.

```
syms C
f =x*cos(x-1)*sin(x);
F = int(f, x);
F_with_C = F + C;
disp(F_with_C);
f =x*exp(1-x)*sin(x);
F = int(f, x);
F_with_C = F + C;
```

```
disp(F_with_C);
f =(-x^2*(2*x-1));
F = int(f, x);
F_with_C = F + C;
disp(F_with_C);
f =x*cos(x-1)*sin(x);
F = int(f, x);
F_with_C = F + C;
disp(F_with_C);
f =x*exp(-x)*cos(x);
F = int(f, x);
F_with_C = F + C;
disp(F_with_C);
```

6.

```
clear;
syms x
f = sin(x^2)*(3*x-x^2);
x_value = 2;
f_at_x = subs(f, x, x_value);
slope_at_x = subs(diff(f, x), x, x_value);
%    y(x) = mx + b
y = slope_at_x * (x - x_value) + f_at_x;
disp(f);
disp(y);
fplot(f, [0 5]);
hold on;
fplot(y, [0 5], 'r--');
scatter(x_value, f_at_x, 'filled', 'MarkerFaceColor', 'r');    % 在切点处标记红点
hold off;
grid on;
clear;

syms x
f = cos(5*x)*exp(x);
x_value = 2;
f_at_x = subs(f, x, x_value);
```

```
slope_at_x = subs(diff(f, x), x, x_value);
%    y(x) = mx + b
y = slope_at_x * (x - x_value) + f_at_x;
disp(f);
disp(y);
fplot(f, [0 5]);
hold on;
fplot(y, [0 5], 'r--');
scatter(x_value, f_at_x, 'filled', 'MarkerFaceColor', 'r');
hold off;
grid on;
clear;

syms x
f = cos(2*x)*exp(x);
x_value = 2;
f_at_x = subs(f, x, x_value);
slope_at_x = subs(diff(f, x), x, x_value);
%    y(x) = mx + b
y = slope_at_x * (x - x_value) + f_at_x;
disp(f);
disp(y);
fplot(f, [0 5]);
hold on;
fplot(y, [0 5], 'r--');
scatter(x_value, f_at_x, 'filled', 'MarkerFaceColor', 'r');
hold off;
grid on;
clear;
```

7.

```
clear;
syms x

f=2*x^5-exp(-x);
x0 = 1;
disp(f);
approximations = zeros(1, 10);
```

```
approximations(1) = x0;
for i = 2:10
    f_value = subs(f, x, approximations(i-1));
    f_prime_value = subs(diff(f, x), x, approximations(i-1));
    approximations(i) = approximations(i-1) - f_value / f_prime_value;
    fprintf('%10d      %10.7f\n', i, approximations(i));
end


clear;
syms x

f=x^2-exp(-x)-1;
x0 = 1;
disp(f);
approximations = zeros(1, 10);
approximations(1) = x0;
for i = 2:10
    f_value = subs(f, x, approximations(i-1));
    f_prime_value = subs(diff(f, x), x, approximations(i-1));
    approximations(i) = approximations(i-1) - f_value / f_prime_value;
    fprintf('%10d      %10.7f\n', i, approximations(i));
end



clear;
syms x

f=-x^3+x^2-1;
x0 = -1;
disp(f);
approximations = zeros(1, 10);
approximations(1) = x0;
for i = 2:10
    f_value = subs(f, x, approximations(i-1));
    f_prime_value = subs(diff(f, x), x, approximations(i-1));
    approximations(i) = approximations(i-1) - f_value / f_prime_value;
```

```
    fprintf('%10d      %10.7f\n', i, approximations(i));
end


clear;
syms x

f=x^2-exp(-x);
x0 = 1;
disp(f);
approximations = zeros(1, 10);
approximations(1) = x0;
for i = 2:10
    f_value = subs(f, x, approximations(i-1));
    f_prime_value = subs(diff(f, x), x, approximations(i-1));
    approximations(i) = approximations(i-1) - f_value / f_prime_value;
    fprintf('%10d      %10.7f\n', i, approximations(i));
end


clear;
syms x

f=x^2-1/(x-1)-1;
x0 = -1;
disp(f);
approximations = zeros(1, 10);
approximations(1) = x0;
for i = 2:10
    f_value = subs(f, x, approximations(i-1));
    f_prime_value = subs(diff(f, x), x, approximations(i-1));
    approximations(i) = approximations(i-1) - f_value / f_prime_value;
    fprintf('%10d      %10.7f\n', i, approximations(i));
end
clear;
8.

clear;
```

```
syms x real
f=2*x*cos(x);
f_prime = diff(f, x);
f_double_prime = diff(f_prime, x);
f_triple_prime = diff(f_double_prime, x);
x_values = linspace(-2, 2, 100);
f_values = subs(f, x, x_values);
f_prime_values = subs(f_prime, x, x_values);
f_double_prime_values = subs(f_double_prime, x, x_values);
f_triple_prime_values = subs(f_triple_prime, x, x_values);
figure;
plot(x_values, f_values, 'LineWidth', 2, 'DisplayName', 'f(x)');
hold on;
plot(x_values, f_prime_values, 'LineWidth', 2, 'DisplayName', 'f''(x)');
plot(x_values, f_double_prime_values, 'LineWidth', 2, 'DisplayName', 'f''''(x)');
plot(x_values, f_triple_prime_values, 'LineWidth', 2, 'DisplayName', 'f''''''(x)');
title('函数及其导数');
legend('show');
grid on;
hold off;
clear;
syms x real
f=x*cos(x)-x^(3/2);
f_prime = diff(f, x);
f_double_prime = diff(f_prime, x);
f_triple_prime = diff(f_double_prime, x);
x_values = linspace(0.05, 2, 100);
f_values = subs(f, x, x_values);
f_prime_values = subs(f_prime, x, x_values);
f_double_prime_values = subs(f_double_prime, x, x_values);
f_triple_prime_values = subs(f_triple_prime, x, x_values);

figure;
plot(x_values, f_values, 'LineWidth', 2, 'DisplayName', 'f(x)');
hold on;
plot(x_values, f_prime_values, 'LineWidth', 2, 'DisplayName', 'f''(x)');
plot(x_values, f_double_prime_values, 'LineWidth', 2, 'DisplayName', 'f''''(x)');
plot(x_values, f_triple_prime_values, 'LineWidth', 2, 'DisplayName', 'f''''''(x)');
```

```
title('函数及其导数');
legend('show');
grid on;
hold off;
clear;
clear;
syms x real
f=-x-x*exp(x);
f_prime = diff(f, x);
f_double_prime = diff(f_prime, x);
f_triple_prime = diff(f_double_prime, x);
x_values = linspace(-2, 2, 100);
f_values = subs(f, x, x_values);
f_prime_values = subs(f_prime, x, x_values);
f_double_prime_values = subs(f_double_prime, x, x_values);
f_triple_prime_values = subs(f_triple_prime, x, x_values);
figure;
plot(x_values, f_values, 'LineWidth', 2, 'DisplayName', 'f(x)');
hold on;
plot(x_values, f_prime_values, 'LineWidth', 2, 'DisplayName', 'f''(x)');
plot(x_values, f_double_prime_values, 'LineWidth', 2, 'DisplayName', 'f''''(x)');
plot(x_values, f_triple_prime_values, 'LineWidth', 2, 'DisplayName', 'f''''''(x)');
title('函数及其导数');
legend('show');
grid on;
hold off;
```

9.

```
clear;
syms x

f=2*x^5-exp(-x);
x0 = 1;
disp(f);
approximations = zeros(1, 10);
approximations(1) = x0;
for i = 2:10
```

```
    f_value = subs(f, x, approximations(i-1));
    f_prime_value = subs(diff(f, x), x, approximations(i-1));
    approximations(i) = approximations(i-1) - f_value / f_prime_value;
    fprintf('%10d      %10.7f\n', i, approximations(i));
end


clear;
syms x

f=x^2-exp(-x)-1;
x0 = 1;
disp(f);
approximations = zeros(1, 10);
approximations(1) = x0;
for i = 2:10
    f_value = subs(f, x, approximations(i-1));
    f_prime_value = subs(diff(f, x), x, approximations(i-1));
    approximations(i) = approximations(i-1) - f_value / f_prime_value;
    fprintf('%10d      %10.7f\n', i, approximations(i));
end



clear;
syms x

f=-x^3+x^2-1;
x0 = -1;
disp(f);
approximations = zeros(1, 10);
approximations(1) = x0;
for i = 2:10
    f_value = subs(f, x, approximations(i-1));
    f_prime_value = subs(diff(f, x), x, approximations(i-1));
    approximations(i) = approximations(i-1) - f_value / f_prime_value;
    fprintf('%10d      %10.7f\n', i, approximations(i));
end
```

```
clear;
syms x

f=x^2-exp(-x);
x0 = 1;
disp(f);
approximations = zeros(1, 10);
approximations(1) = x0;
for i = 2:10
    f_value = subs(f, x, approximations(i-1));
    f_prime_value = subs(diff(f, x), x, approximations(i-1));
    approximations(i) = approximations(i-1) - f_value / f_prime_value;
    fprintf('%10d      %10.7f\n', i, approximations(i));
end


clear;
syms x

f=x^2-1/(x-1)-1;
x0 = -1;
disp(f);
approximations = zeros(1, 10);
approximations(1) = x0;
for i = 2:10
    f_value = subs(f, x, approximations(i-1));
    f_prime_value = subs(diff(f, x), x, approximations(i-1));
    approximations(i) = approximations(i-1) - f_value / f_prime_value;
    fprintf('%10d      %10.7f\n', i, approximations(i));
end
clear;
10.

syms x real
f = 5*x^3-x^2-8;
f_prime = diff(f, x);
```

```
critical_points = solve(f_prime == 0, x);


x_values = linspace(-2, 2, 100);
f_values = subs(f, x, x_values);
disp(critical_points);

critical_points_values = subs(f, x, critical_points);


figure;
plot(x_values, f_values, 'LineWidth', 2, 'DisplayName', 'f(x)');
hold on;

scatter(critical_points, critical_points_values, 50, 'r', 'filled', 'DisplayName', '0');

legend('show');
grid on;
hold off;
syms x real
f = x^5-5*x-5;
f_prime = diff(f, x);


critical_points = solve(f_prime == 0, x);


x_values = linspace(-2, 2, 100);
f_values = subs(f, x, x_values);
disp(critical_points);

critical_points_values = subs(f, x, critical_points);


figure;
plot(x_values, f_values, 'LineWidth', 2, 'DisplayName', 'f(x)');
```

```
hold on;

scatter(critical_points, critical_points_values, 50, 'r', 'filled', 'DisplayName', '0');

legend('show');
grid on;
hold off;
syms x real
f = (1/(x^x))-1;
f_prime = diff(f, x);



critical_points = solve(f_prime == 0, x);



x_values = linspace(0.1, 2, 100);
f_values = subs(f, x, x_values);
disp(critical_points);

critical_points_values = subs(f, x, critical_points);



figure;
plot(x_values, f_values, 'LineWidth', 2, 'DisplayName', 'f(x)');
hold on;

scatter(critical_points, critical_points_values, 50, 'r', 'filled', 'DisplayName', '0');

legend('show');
grid on;
hold off;
11.

clear;
syms x
f = sin(x^2)*(3*x-x^2);
x_value = 2;
f_at_x = subs(f, x, x_value);
```

```
slope_at_x = subs(diff(f, x), x, x_value);
%    y(x) = mx + b
y = slope_at_x * (x - x_value) + f_at_x;
disp(f);
disp(y);
fplot(f, [0 5]);
hold on;
fplot(y, [0 5], 'r--');
scatter(x_value, f_at_x, 'filled', 'MarkerFaceColor', 'r');
hold off;
grid on;
clear;
syms x
f =cos(3*x)*exp(-x);
x_value = 2;
f_at_x = subs(f, x, x_value);
slope_at_x = subs(diff(f, x), x, x_value);
%    y(x) = mx + b
y = slope_at_x * (x - x_value) + f_at_x;
disp(f);
disp(y);
fplot(f, [0 5]);
hold on;
fplot(y, [0 5], 'r--');
scatter(x_value, f_at_x, 'filled', 'MarkerFaceColor', 'r');
hold off;
grid on;
clear;
clear;
syms x
f = exp(-x^2)*(x^2+3*x);
x_value = 2;
f_at_x = subs(f, x, x_value);
slope_at_x = subs(diff(f, x), x, x_value);
%    y(x) = mx + b
y = slope_at_x * (x - x_value) + f_at_x;
disp(f);
disp(y);
```

```
fplot(f, [0 5]);
hold on;
fplot(y, [0 5], 'r--');
scatter(x_value, f_at_x, 'filled', 'MarkerFaceColor', 'r');
hold off;
grid on;
clear;
clear;
syms x
f = tan(3*x)*exp(x);
x_value = 2;
f_at_x = subs(f, x, x_value);
slope_at_x = subs(diff(f, x), x, x_value);
%    y(x) = mx + b
y = slope_at_x * (x - x_value) + f_at_x;
disp(f);
disp(y);
fplot(f, [0 5]);
hold on;
fplot(y, [0 5], 'r--');
scatter(x_value, f_at_x, 'filled', 'MarkerFaceColor', 'r');
hold off;
grid on;
clear;
syms x
f = sin(x);
x_value = 2;
f_at_x = subs(f, x, x_value);
slope_at_x = subs(diff(f, x), x, x_value);
%    y(x) = mx + b
y = slope_at_x * (x - x_value) + f_at_x;
disp(f);
disp(y);
fplot(f, [0 5]);
hold on;
fplot(y, [0 5], 'r--');
scatter(x_value, f_at_x, 'filled', 'MarkerFaceColor', 'r');
hold off;
```

```
grid on;
clear;
```
12.

```
clear;
syms x real
f=exp(x)+2*sin(x)+1;
f_prime = diff(f, x);
f_double_prime = diff(f_prime, x);
f_triple_prime = diff(f_double_prime, x);
x_values = linspace(-2, 2, 100);
f_values = subs(f, x, x_values);
f_prime_values = subs(f_prime, x, x_values);
f_double_prime_values = subs(f_double_prime, x, x_values);
f_triple_prime_values = subs(f_triple_prime, x, x_values);
figure;
plot(x_values, f_values, 'LineWidth', 2, 'DisplayName', 'f(x)');
hold on;
plot(x_values, f_prime_values, 'LineWidth', 2, 'DisplayName', 'f''(x)');
plot(x_values, f_double_prime_values, 'LineWidth', 2, 'DisplayName', 'f''''(x)');
plot(x_values, f_triple_prime_values, 'LineWidth', 2, 'DisplayName', 'f''''''(x)');
title('函数及其导数');
legend('show');
grid on;
hold off;
clear;
syms x real
f=x^4/20+2*x^2+1;
f_prime = diff(f, x);
f_double_prime = diff(f_prime, x);
f_triple_prime = diff(f_double_prime, x);
x_values = linspace(-2, 2, 100);
f_values = subs(f, x, x_values);
f_prime_values = subs(f_prime, x, x_values);
f_double_prime_values = subs(f_double_prime, x, x_values);
f_triple_prime_values = subs(f_triple_prime, x, x_values);

figure;
```

```
plot(x_values, f_values, 'LineWidth', 2, 'DisplayName', 'f(x)');
hold on;
plot(x_values, f_prime_values, 'LineWidth', 2, 'DisplayName', 'f''(x)');
plot(x_values, f_double_prime_values, 'LineWidth', 2, 'DisplayName', 'f''''(x)');
plot(x_values, f_triple_prime_values, 'LineWidth', 2, 'DisplayName', 'f''''''(x)');
title('函数及其导数');
legend('show');
grid on;
hold off;
clear;
clear;
syms x real
f=x*sin(x^2)*exp(x);
disp(f);
f_prime = diff(f, x);
f_double_prime = diff(f_prime, x);
f_triple_prime = diff(f_double_prime, x);
x_values = linspace(-2, 2, 100);
f_values = subs(f, x, x_values);
f_prime_values = subs(f_prime, x, x_values);
f_double_prime_values = subs(f_double_prime, x, x_values);
f_triple_prime_values = subs(f_triple_prime, x, x_values);
figure;
plot(x_values, f_values, 'LineWidth', 2, 'DisplayName', 'f(x)');
hold on;
plot(x_values, f_prime_values, 'LineWidth', 2, 'DisplayName', 'f''(x)');
plot(x_values, f_double_prime_values, 'LineWidth', 2, 'DisplayName', 'f''''(x)');
plot(x_values, f_triple_prime_values, 'LineWidth', 2, 'DisplayName', 'f''''''(x)');
title('函数及其导数');
legend('show');
grid on;
hold off;
13.

f =    (cos(x-1)*exp(1/x^2))/cos(x);
df = diff(f, x);
disp(df);
f =    x*cot(x-1)*exp(x^2);
```

```
df = diff(f, x);
disp(df);
f =    tan(x-1)*exp(x^2)*cos(x);
df = diff(f, x);
disp(df);
f =    (x*exp(x^2))/cos(x-1);
df = diff(f, x);
disp(df);
f =    2*x*sin(x-1)*exp(x^2);
df = diff(f, x);
disp(df);
```

14.

```
syms x real
f = x^3-3*sqrt(x)-4;
f_prime = diff(f, x);


critical_points = solve(f_prime == 0, x);


x_values = linspace(0.1, 2, 100);
f_values = subs(f, x, x_values);
disp(critical_points);

critical_points_values = subs(f, x, critical_points);


figure;
plot(x_values, f_values, 'LineWidth', 2, 'DisplayName', 'f(x)');
hold on;

scatter(critical_points, critical_points_values, 50, 'r', 'filled', 'DisplayName', '0');

legend('show');
grid on;
hold off;
syms x real
f = x^3-3*x^2-1;
```

```
f_prime = diff(f, x);


critical_points = solve(f_prime == 0, x);


x_values = linspace(-2, 2, 100);
f_values = subs(f, x, x_values);
disp(critical_points);

critical_points_values = subs(f, x, critical_points);


figure;
plot(x_values, f_values, 'LineWidth', 2, 'DisplayName', 'f(x)');
hold on;

scatter(critical_points, critical_points_values, 50, 'r', 'filled', 'DisplayName', '0');

legend('show');
grid on;
hold off;
syms x real
f = 3*x^3-5*x+3;
f_prime = diff(f, x);


critical_points = solve(f_prime == 0, x);


x_values = linspace(-2, 2, 100);
f_values = subs(f, x, x_values);
disp(critical_points);
disp(f)
critical_points_values = subs(f, x, critical_points);


figure;
```

```
plot(x_values, f_values, 'LineWidth', 2, 'DisplayName', 'f(x)');
hold on;

scatter(critical_points, critical_points_values, 50, 'r', 'filled', 'DisplayName', '0');

legend('show');
grid on;
hold off;
```

15.

```
syms x real
f = sin(exp(x))/(x^2+1);
disp(f);
a = 1;
b = 3;
n = 100;
delta_x = (b - a) / n;

approximate_area = 0;

for i = 1:n
    right_endpoint = a + i * delta_x;    % 使用右端点
    approximate_area = approximate_area + subs(f, x, right_endpoint) * delta_x;
end

disp(double(approximate_area));
clear;
syms x real
f = (-sin(x+1)*sin(x)*(x+1));
disp(f);
a = 1;
b = 2;
n = 150;
delta_x = (b - a) / n;

approximate_area = 0;
for i = 1:n
    right_endpoint = a + i * delta_x;    % 使用右端点
```

```
    approximate_area = approximate_area + subs(f, x, right_endpoint) * delta_x;
end
disp(double(approximate_area));
clear;
syms x real
f = cos(x+1)/(x^2+1);
disp(f);
a = 1;
b = 10;
n = 100;
delta_x = (b - a) / n;

approximate_area = 0;

for i = 1:n
    right_endpoint = a + i * delta_x;    % 使用右端点
    approximate_area = approximate_area + subs(f, x, right_endpoint) * delta_x;
end

disp(double(approximate_area));
clear;
syms x real
f = cos(exp(-1/x))/(x^2+1);
disp(f);
a = 1;
b = 2;
n = 100;
delta_x = (b - a) / n;

approximate_area = 0;
for i = 1:n
    right_endpoint = a + i * delta_x;    % 使用右端点
    approximate_area = approximate_area + subs(f, x, right_endpoint) * delta_x;
end

disp(double(approximate_area));
clear;
syms x real
```

```
f = cos(x+1)/(x^2+1);
disp(f);
a = 1;
b = 10;
n = 10;
delta_x = (b - a) / n;

approximate_area = 0;

for i = 1:n
    right_endpoint = a + i * delta_x;    % 使用右端点
    approximate_area = approximate_area + subs(f, x, right_endpoint) * delta_x;
end

disp(double(approximate_area));
```

16.

```
syms x
f = (-cos(x)*sin(x)-1/x^2);
a = 1;
b = 2*pi;
integral_result = int(f, a, b);
disp(integral_result);

f = (x+x*sin(pi*x));
disp(f);
a = 1;
b = 2*pi;
integral_result = int(f, a, b);
disp(integral_result);
f = (x*cos(x^2)*sin(x^2));
a = 1;
b = pi;
integral_result = int(f, a, b);
disp(integral_result);
```

17.

```
syms x real
```

```
f = sin(exp(x))/(x^2+1);
disp(f);
a = 1;
b = 3;
n = 100;
delta_x = (b - a) / n;

approximate_area = 0;

for i = 1:n
    right_endpoint = a + i * delta_x;    % 使用右端点
    approximate_area = approximate_area + subs(f, x, right_endpoint) * delta_x;
end

disp(double(approximate_area));
clear;
syms x real
f = (-sin(x+1)*sin(x)*(x+1));
disp(f);
a = 1;
b = 2;
n = 150;
delta_x = (b - a) / n;

approximate_area = 0;
for i = 1:n
    right_endpoint = a + i * delta_x;    % 使用右端点
    approximate_area = approximate_area + subs(f, x, right_endpoint) * delta_x;
end
disp(double(approximate_area));
clear;
syms x real
f = cos(x+1)/(x^2+1);
disp(f);
a = 1;
b = 10;
n = 100;
delta_x = (b - a) / n;
```

```
approximate_area = 0;

for i = 1:n
    right_endpoint = a + i * delta_x;    % 使用右端点
    approximate_area = approximate_area + subs(f, x, right_endpoint) * delta_x;
end

disp(double(approximate_area));
clear;
syms x real
f = cos(exp(-1/x))/(x^2+1);
disp(f);
a = 1;
b = 2;
n = 100;
delta_x = (b - a) / n;

approximate_area = 0;
for i = 1:n
    right_endpoint = a + i * delta_x;    % 使用右端点
    approximate_area = approximate_area + subs(f, x, right_endpoint) * delta_x;
end

disp(double(approximate_area));
clear;
syms x real
f = cos(x+1)/(x^2+1);
disp(f);
a = 1;
b = 10;
n = 10;
delta_x = (b - a) / n;

approximate_area = 0;

for i = 1:n
    right_endpoint = a + i * delta_x;    % 使用右端点
```

```
        approximate_area = approximate_area + subs(f, x, right_endpoint) * delta_x;
end

disp(double(approximate_area));
```
18.

```
f = cos(1/x)*sin(1/x)*exp(-x^2);
disp(f);
lim_value = limit(f, x, 0);
disp(lim_value);
f = piecewise(x ~= 1, abs(exp(-x)-x) /abs(x^2-1), x == 1, 0);
disp(f);
lim_value = limit(f, x, 1);
disp(lim_value);
f = (exp(-x)*abs(x)^5)/abs(cos(x));
disp(f);
lim_value = limit(f, x, 1);
disp(lim_value);
f = x*exp(3*x)*sin(x);
disp(f);
df = diff(f, x);
lim_value = limit(df, x, 0);
disp(lim_value);
f = (x^2*sin(1/x))/cos(1/x);
disp(f);
df = diff(f, x);
lim_value = limit(df, x, 1);
disp(lim_value);
```
19.

```
f = (cos(x)*sin(x)-x);
disp(f);
a = -pi;
b = 2*pi;
integral_result = int(f, a, b);
disp(integral_result);
f = (exp(-x)*(x^2+1));
disp(f);
```

```
a = -1;
b = 1;
integral_result = int(f, a, b);
disp(integral_result);
f = (x*cos(x^2)*sin(x^2));
disp(f);
a = 0;
b = pi;
integral_result = int(f, a, b);
disp(integral_result);
f = (-exp(x^2)*(x+1));
disp(f);
a = 1;
b = -Inf;
integral_result = int(f, a, b);
disp(integral_result);
f = (((x-3)/x)-x*exp(-x^2));
disp(f);
a = 1;
b = 2;
integral_result = int(f, a, b);
disp(integral_result);
```

20.

```
syms C
f =x*exp(-x)*cos(x);
F = int(f, x);
F_with_C = F + C;
disp(F_with_C);
f =x*cos(x-1)*sin(x);
F = int(f, x);
F_with_C = F + C;
disp(F_with_C);
f =(-x^2*(2*x-1));
F = int(f, x);
F_with_C = F + C;
disp(F_with_C);
f =x*exp(1-x)*sin(x);
```

```
F = int(f, x);
F_with_C = F + C;
disp(F_with_C);
f =x*cos(x-1)*sin(x);
F = int(f, x);
F_with_C = F + C;
disp(F_with_C);
```