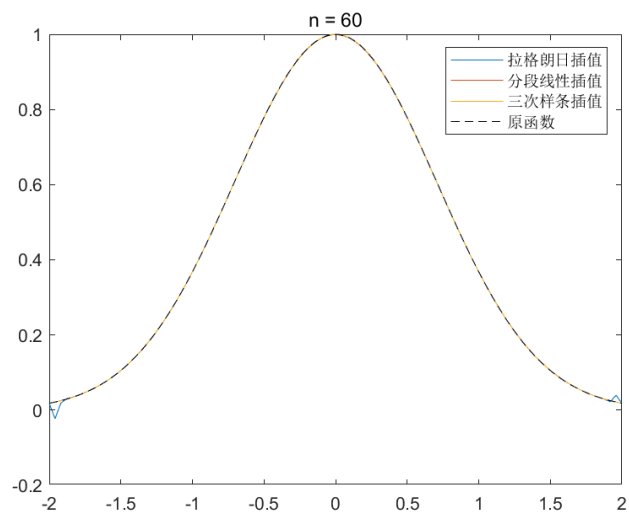
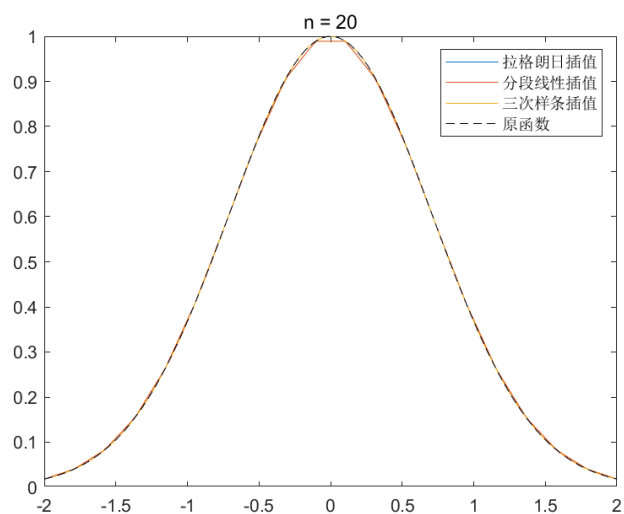
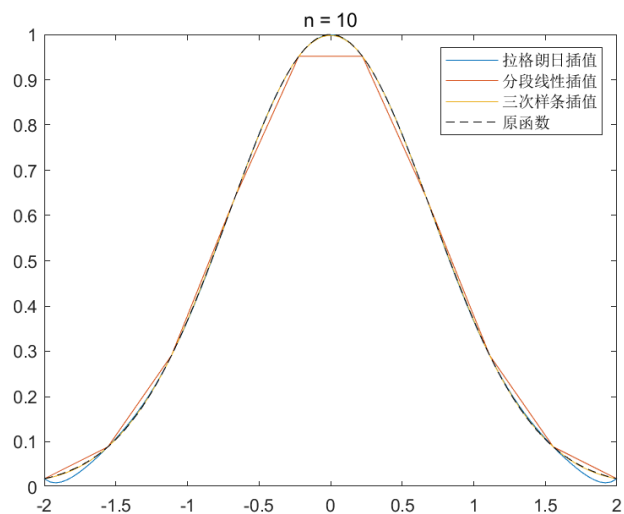


第三次作业

3.4.1(4)

m 取值100编写了 n 的函数，每个 n 值做一幅图。并用for循环观察 n 从10到70的变化(图片结果只列三个)： $n \in [10, 60]$ 时，图像误差随 n 增大逐渐变小；而 $n \geq 60$ 时就会出现龙格现象。数据误差的列举中我们只考虑最大值。



```
ans =  
  
    0.0034    0.0208    0.0012  
  
ans =  
  
    0.0000    0.0049    0.0000
```

code:

```
for i = 10:60  
    ff(i)  
    pause;  
end  
  
function y = ff(n)  
    x0 = linspace(-2, 2, n);  
    x = linspace(-2, 2, 100);  
    y0 = exp(-x0.^2);  
    y1 = lagr(x0, y0, x);  
    y2 = interp1(x0, y0, x);  
    y3 = interp1(x0, y0, x, 'spline');  
    y4 = exp(-x.^2);  
    [max(y1 - y4), max(y2 - y4), max(y3 - y4)]  
    plot(x, y1, x, y2, x, y3, x, y4, 'k--');  
    legend('拉格朗日插值', '分段线性插值', '三次样条插值', '原函数', 'Location', 'best');  
end
```

3.4.4 (4)

梯形法中步长用n来改变。后两方法分别限制误差在 10^{-4} , 10^{-8} , 10^{-10} 内

梯形法:

```
ans =  
  
    0.954384567677887    0.954470941689636    0.954486938396614
```

辛普森法:

```
ans =  
  
    0.954504037005460    0.954499736171375    0.954499736104278
```

Gauss-Lobatto法:

```
ans =  
  
    0.954470555734192    0.954499736102396    0.954499736103641
```

code:

```
f = @(x) (1 / sqrt(2 * pi)) * exp(-x.^2 / 2);
y1 = @(n) trapz(linspace(a, b, n+1), f(linspace(a, b, n+1)));
y2 = @(tol) quad(f, a, b, tol);
y3 = @(tol) quadl(f, a, b, tol);
a = -2;
b = 2;
disp('梯形法:');
format long
[y1(50) y1(100) y1(150)]
disp('辛普森法:');
format long
[y2(1.0e-4) y2(1.0e-8) y2(1.0e-10)]
disp('Gauss-Lobatto法:');
format long
[y3(1.0e-4) y3(1.0e-8) y3(1.0e-10)]
```