Newton 法を試してみる

In [1]:
```
f(x) = x^2 - 3.0
```
Out[1]:
```
f (generic function with 1 method)
```
In [2]:
```
df(x) = 2x
```
Out[2]:
```
df (generic function with 1 method)
```
In [3]:
```
newton(x) = x - f(x)/df(x)
```
Out[3]:
```
newton (generic function with 1 method)
```
In [4]:
```
x0 = 2.0
x1 = newton(x0)
```
Out[4]:
```
1.75
```
In [5]:
```
x2 = newton(x1)
```
Out[5]:
```
1.7321428571428572
```
In [6]:
```
x3 = newton(x2)
```
Out[6]:
```
1.7320508100147276
```
In [7]:
```
f(x2), df(x2)
```
Out[7]:
```
(0.00031887755102077975, 3.4642857142857144)
```

高階微分

In [8]:
```
using SymPy
```
In [9]:
```
@syms x
```
Out[9]:
```
(x,)
```
In [10]:
```
g = (x^2 + x)*cos(x)
```
Out[10]:

$$\left(x^{2} + x\right) \cos{\left(x \right)}$$

In [15]:
```
g1 = diff( g, x )
```
Out[15]:

$$\left(2 x + 1\right) \cos{\left(x \right)} - \left(x^{2} + x\right) \sin{\left(x \right)}$$

In [17]:
```
g2 = diff( g1, x )
```
Out[17]:
$$-2(2x+1)\sin(x) - (x^2+x)\cos(x) + 2\cos(x)$$

In [18]:
```
g3 = diff( g2, x )
```
Out[18]:
$$-3(2x+1)\cos(x) + (x^2+x)\sin(x) - 6\sin(x)$$

In [19]:
```
simplify( g3 )
```
Out[19]:
$$x(x+1)\sin(x) + (-6x-3)\cos(x) - 6\sin(x)$$

In [20]:
```
# 実はいきなり高階微分を計算できる
h = diff( g, x => 3)
```
Out[20]:
$$x(x+1)\sin(x) - 3(2x+1)\cos(x) - 6\sin(x)$$

In [21]:
```
simplify(h)
```
Out[21]:
$$x(x+1)\sin(x) + (-6x-3)\cos(x) - 6\sin(x)$$

Taylor展開を実際に

In [27]:
```
series( x*sin(x), x, 0, 6 )
```
Out[27]:
$$x^2 - \frac{x^4}{6} + O(x^6)$$

In [26]:
```
series( log(1+x), x, 0, 6 )
```
Out[26]:
$$x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \frac{x^5}{5} + O(x^6)$$

極限計算も.

In [28]:
```
limit( (exp(x^2) - cos(x) )/(x*sin(x)), x => 0 )
```
Out[28]:
$$\frac{3}{2}$$

In [ ]:
```

```