

## 1 基本のき

```
> diff(exp(x^x),x);
```

$$x^x (\ln(x) + 1) e^{x^x} \quad (1.1)$$

```
> series(log((1+x)/(1-x)),x=0);
```

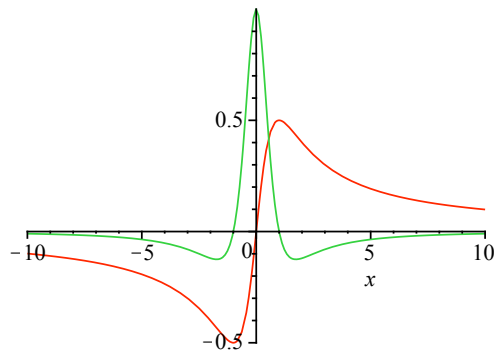
$$2x + \frac{2}{3}x^3 + \frac{2}{5}x^5 + O(x^6) \quad (1.2)$$

```
> int(x^2*cos(x),x);
```

$$x^2 \sin(x) - 2 \sin(x) + 2x \cos(x) \quad (1.3)$$

```
> f1:=unapply(x/(x^2+1),x);
> plot([f1(x),diff(f1(x),x)],x);
```

$$f1 := x \rightarrow \frac{x}{x^2 + 1}$$



## 2 式変形

```
> eq1:=x^2-(k+1)*x-3*k^2=0;
```

```
eq2:=x^2-(k-1)*x-k^2=0;
```

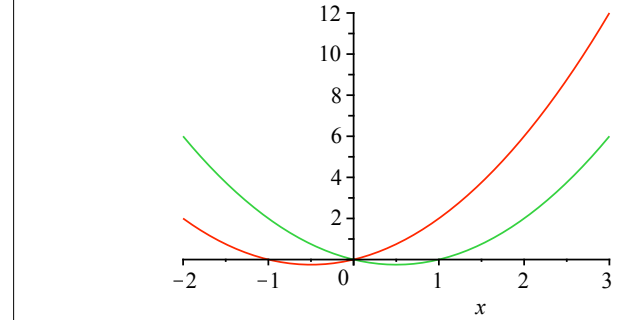
$$eq1 := x^2 - (k+1)x - 3k^2 = 0$$

$$eq2 := x^2 - (k-1)x - k^2 = 0 \quad (2.1)$$

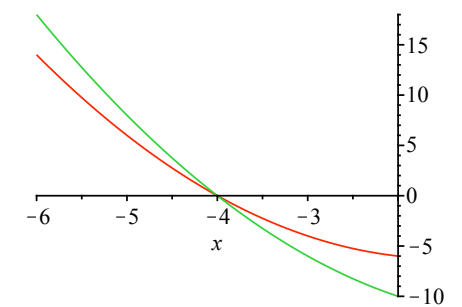
```
> solve({eq1,eq2},{x,k});
```

$$\{x=0, k=0\}, \{k=-2, x=-4\}, \{k=1, x=-1\} \quad (2.2)$$

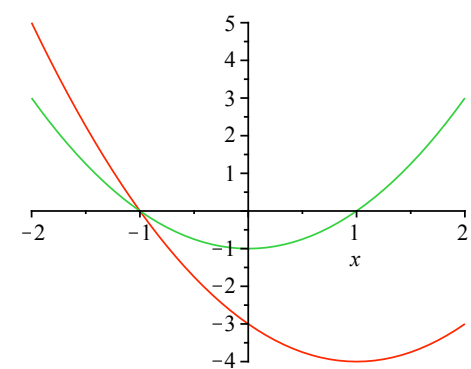
```
> plot(subs(k=0,{lhs(eq1),lhs(eq2)}),x=-2..3);
```



```
> plot(subs(k=-2,{lhs(eq1),lhs(eq2)}),x=-6..-2);
```



```
> plot(subs(k=1,{lhs(eq1),lhs(eq2)}),x=-2..2);
```



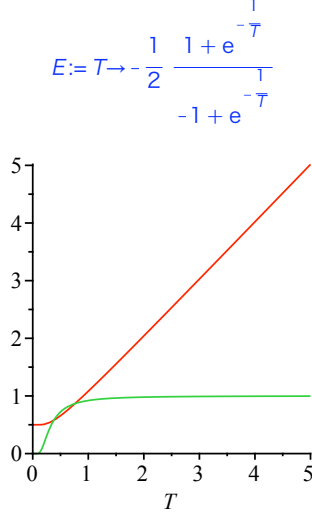
## 3 微積分

```
> Z:=unapply(exp(-1/(2*T))/(1-exp(-1/T)),T);
```

$$Z := T \rightarrow \frac{e^{-2T}}{1 - e^{-T}}$$

(3.1)

```
> E:=unapply(simplify(T^2*diff(ln(Z(T)),T)),T);
plot([E(T),diff(E(T),T)],T=0..5);
```



#### ▼ 4 線形代数と式変形

```
> with(LinearAlgebra):
A:=Matrix([[1,1,1],[a,b,c],[a^2,b^2,c^2]]);
```

$$A := \begin{bmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{bmatrix}$$

(3.1.1)

```
> factor(Determinant(A));
-(c-a)(-a+b)(-c+b)
```

(3.1.2)

#### ▼ 5 数値積分(矩形近似)

```
> restart;
> f1:=unapply(-x^2+7*x,x):
n:=4:
dx:=(3-1)/n:
```

```
x0:=1-dx;
sum1:=0:
for i from 1 to n do
  x0:=x0+dx;
  sum1:=sum1+f1(x0)*dx;
  print(i,x0,f1(x0),sum1);
end do:
evalf(sum1);
```

```
x0:= 1/2
1, 1, 6, 3
2, 3/2, 33/4, 57/8
3, 2, 10, 97/8
4, 5/2, 45/4, 71/4
17.7500000000
```

(4.1)

#### ▼ 描画

```
> with(plots):with(plottools):
x0:=1:
l1:=[]:l2:=[]:
lines:=[];
for i from 1 to n do
  l1:=[op(l1),[[x0,0],[x0,f1(x0)]]];
  l2:=[op(l2),[[x0,f1(x0)],[x0+dx,f1(x0)]]];
  lines:=[op(lines),line(op(l1[i])),line(op(l2[i])));
  x0:=x0+dx;
end do:
lines:=[op(lines),line([x0,0],[x0,f1(x0-dx)])]:
lines:=[]
```

(4.1.1)

```
> p1:=plot(f1(x),x=0..5):
display([p1,op(lines)]);
```

