

ديفرانسيل حساب

Limit : ميگير حد

Limit [Sin[x] / x, x -> 0]

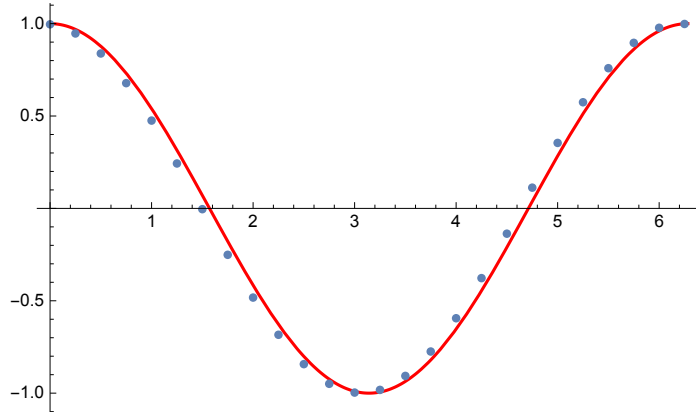
1

مشتق

```

ep = 0.15;
Table[{x, (Sin[x + ep] - Sin[x]) / ep}, {x, 0, 2 Pi, 0.25}];
Show[Plot[Cos[x], {x, 0, 2 Pi}, PlotStyle -> Red],
ListPlot[%, PlotRange -> {{0, 2 Pi}, {-1, 1}}]]

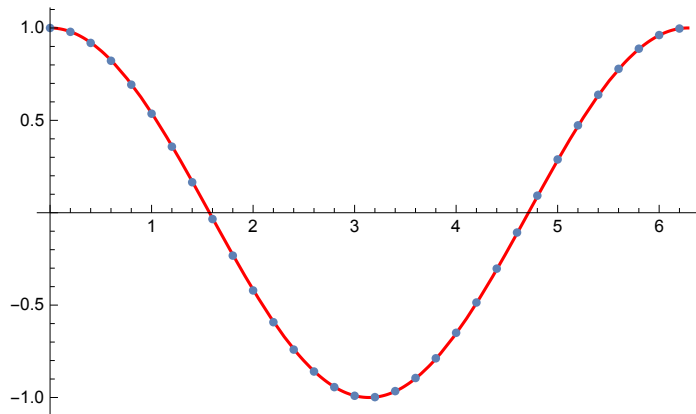
```



```

ep = 0.01;
Table[{x, (Sin[x + ep] - Sin[x]) / ep}, {x, 0, 2 Pi, 0.2}];
Show[Plot[Cos[x], {x, 0, 2 Pi}, PlotStyle -> Red],
ListPlot[%, PlotRange -> {{0, 2 Pi}, {-1, 1}}]]

```



هستند آن بعدی شتقات ... , $f''[x]$, $f'[x]$ باشد، تابع یک $f[x]$ اگر

$$f[x_] = x^6 \text{Sin}[x]$$

$$x^6 \text{Sin}[x]$$

$$f'[x]$$

$$f''[x]$$

$$f'''[x]$$

$$f''''[x]$$

$$x^6 \text{Cos}[x] + 6 x^5 \text{Sin}[x]$$

$$12 x^5 \text{Cos}[x] + 30 x^4 \text{Sin}[x] - x^6 \text{Sin}[x]$$

$$90 x^4 \text{Cos}[x] - x^6 \text{Cos}[x] + 120 x^3 \text{Sin}[x] - 18 x^5 \text{Sin}[x]$$

$$480 x^3 \text{Cos}[x] - 24 x^5 \text{Cos}[x] + 360 x^2 \text{Sin}[x] - 180 x^4 \text{Sin}[x] + x^6 \text{Sin}[x]$$

کرد حساب خاصی نقطه در را مشتق میتوان

$$f''''[\text{Pi}/4] // \text{N}$$

$$61.3544$$

$D[f[x], \{x, n\}]$: مشتق n ابع x میدهد را

$$D[f[x], x]$$

$$x^6 \text{Cos}[x] + 6 x^5 \text{Sin}[x]$$

$$D[f[x], \{x, 18\}]$$

$$6168960 x \text{Cos}[x] - 97920 x^3 \text{Cos}[x] + 108 x^5 \text{Cos}[x] + 13366080 \text{Sin}[x] - 1101600 x^2 \text{Sin}[x] + 4590 x^4 \text{Sin}[x] - x^6 \text{Sin}[x]$$

$$D[f[x], \{x, 18\}] /. x \rightarrow \text{Pi}/3$$

$$6683040 \sqrt{3} + 1028160 \pi - 61200 \sqrt{3} \pi^2 - \frac{5440 \pi^3}{3} + \frac{85 \pi^4}{\sqrt{3}} + \frac{2 \pi^5}{9} - \frac{\pi^6}{486 \sqrt{3}}$$

$$\% // \text{N}$$

$$1.37079 \times 10^7$$

$$D[\text{Sin}[x y] \text{Sin}[z] / (x^2 + y^2), x, y, z]$$

$$-\frac{2 x^2 \text{Cos}[x y] \text{Cos}[z]}{(x^2 + y^2)^2} - \frac{2 y^2 \text{Cos}[x y] \text{Cos}[z]}{(x^2 + y^2)^2} +$$

$$\frac{\text{Cos}[x y] \text{Cos}[z]}{x^2 + y^2} + \frac{8 x y \text{Cos}[z] \text{Sin}[x y]}{(x^2 + y^2)^3} - \frac{x y \text{Cos}[z] \text{Sin}[x y]}{x^2 + y^2}$$

$$D[\text{Sin}[x y] \text{Sin}[z] / (x^2 + y^2), \{x, y, z\}]$$

$$\left\{ \frac{y \text{Cos}[x y] \text{Sin}[z]}{x^2 + y^2} - \frac{2 x \text{Sin}[x y] \text{Sin}[z]}{(x^2 + y^2)^2}, \frac{x \text{Cos}[x y] \text{Sin}[z]}{x^2 + y^2} - \frac{2 y \text{Sin}[x y] \text{Sin}[z]}{(x^2 + y^2)^2}, \frac{\text{Cos}[z] \text{Sin}[x y]}{x^2 + y^2} \right\}$$

Derivative[n1, n2, ...][f][x, y, ...] :

y ... به نسبت بار n2 و x به نسبت بار n1 تعداد به f از

$$g[x_, y_, z_] = \text{Sin}[x y] \text{Sin}[z] / (x^2 + y^2);$$

Derivative[1, 1, 1][g][x, y, z]

$$-\frac{2 x^2 \text{Cos}[x y] \text{Cos}[z]}{(x^2 + y^2)^2} - \frac{2 y^2 \text{Cos}[x y] \text{Cos}[z]}{(x^2 + y^2)^2} + \frac{\text{Cos}[x y] \text{Cos}[z]}{x^2 + y^2} + \frac{8 x y \text{Cos}[z] \text{Sin}[x y]}{(x^2 + y^2)^3} - \frac{x y \text{Cos}[z] \text{Sin}[x y]}{x^2 + y^2}$$

Derivative[1, 1, 1][g][x, y, z] /. x → 1 /. y → 2

$$-\frac{1}{5} \text{Cos}[2] \text{Cos}[z] - \frac{34}{125} \text{Cos}[z] \text{Sin}[2]$$

Dt کامل مشتق :

Dt[x y^2]

$$y^2 \text{Dt}[x] + 2 x y \text{Dt}[y]$$

Dt[x y^2, x]

$$y^2 + 2 x y \text{Dt}[y, x]$$

Dt[x y^2, {x, 2}]

$$4 y \text{Dt}[y, x] + x (2 \text{Dt}[y, x]^2 + 2 y \text{Dt}[y, \{x, 2\}])$$

Dt[a x + b, x]

$$a + x \text{Dt}[a, x] + \text{Dt}[b, x]$$

Dt[a x + b, x, Constants → {a}]

$$a + \text{Dt}[b, x, \text{Constants} \rightarrow \{a\}]$$

Dt[a x + b, x, Constants → {a, b}]

$$a$$

انتگرال

```
dx = 0.5;  
Table[Sin[x + dx/2] dx, {x, 0, Pi, dx}];  
Total[%]  
dx = 0.01;  
Table[Sin[x + dx/2] dx, {x, 0, Pi, dx}];  
Total[%]  
Cos[0.] - Cos[Pi]  
1.95678  
  
1.99997  
  
2.
```

میگیرد x به نسبت را f انتگرال : `Integrate[f[x], x]`

`Integrate[x^n, x]`

$$\frac{x^{1+n}}{1+n}$$

`f[x_] = x^2 Sin[x] Exp[-x];`

`Integrate[f[x], x]`

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

`Integrate[Sin[x^2], x]`

$$\sqrt{\frac{\pi}{2}} \operatorname{FresnelS}\left[\sqrt{\frac{2}{\pi}} x\right]$$

میکنند حساب را b تا a از انتگرال : `Integrate[f[x], {x, a, b}]`

`Integrate[Tanh[x], {x, 0, 1}]`

`Log[Cosh[1]]`

`N[%]`

0.433781

`Integrate[(1+x^2)^(-1), {x, -Infinity, Infinity}]`

π

نیست مقذور انتگرالی هر البته

`Integrate[Sin[Sin[x]], x]`

$$\int \sin[\sin[x]] dx$$

عددي انتگرال

میکنند حساب تقریبی را انتگرال : `NIntegrate[f[x], {x, a, b}]`

`NIntegrate[Sin[Sin[x]], {x, 0, 10}]`

1.6296

انتگرال حسب بر نواع

`F[t_] = Integrate[f[x], {x, a, t}]`

$$\frac{1}{2} \left((1+a) e^{-a} \left((1+a) \cos[a] + (-1+a) \sin[a] \right) - e^{-t} (1+t) \left((1+t) \cos[t] + (-1+t) \sin[t] \right) \right)$$

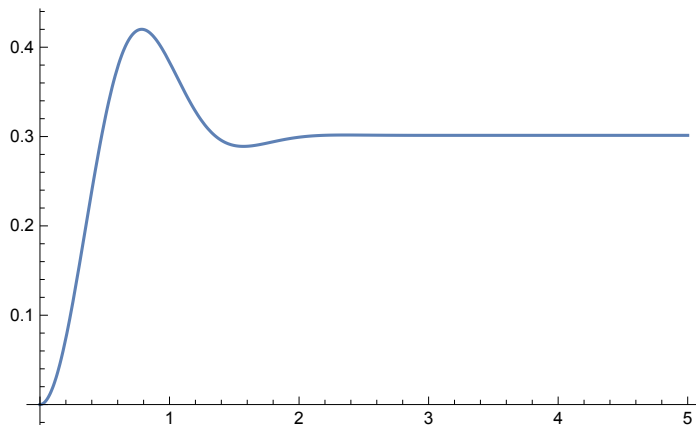
```
F[x_] = Integrate[Exp[-t^2] Sin[4 t], {t, 0, x}]
```

$$\frac{\sqrt{\pi} (-2 \operatorname{Erfi}[2] + \operatorname{Erfi}[2 - i x] + \operatorname{Erfi}[2 + i x])}{4 e^4}$$

```
N[F[2]]
```

```
0.299274 + 0. i
```

```
Plot[F[x], {x, 0, 5}, PlotRange -> All]
```



عددي انتگرال با تابعیت

```
F[x_] := NIntegrate[Exp[-t^2] Sin[4 t], {t, 0, x}]
```

```
FindRoot[F[x] == 0.3, {x, 0.5}]
```

```
{x -> 0.475046}
```

```
G[x_?NumberQ] := NIntegrate[Exp[-t^2] Sin[4 t], {t, 0, x}]
```

```
FindRoot[G[x] == 0.3, {x, 0.5}]
```

```
{x -> 0.475046}
```

چندگانه انتگرالهاي

```
Integrate[x y^2, x, y]
```

$$\frac{x^2 y^3}{6}$$

```
Integrate[x y^2, x]
```

$$\frac{x^2 y^2}{2}$$

```
NIntegrate[Sin[x]/x, {x, -Infinity, Infinity}]
```

```
3.14159
```

معین ی چندگانہ

`Integrate[f[x, y], {x, xmin, xmax}, {y, ymin, ymax}]`

`Integrate[f[x, y, z], {x, xmin, xmax}, {y, ymin, ymax}, {z, zmin, zmax}]`

`NIntegrate[f[x, y, z], {x, xmin, xmax}, {y, ymin, ymax}, {z, zmin, zmax}]`

`Integrate[x^2 + y^2, {x, 0, 1}, {y, 0, 1}]`

$\frac{2}{3}$

`Integrate[x^2 + y^2, {x, 0, 1}, {y, 0, x}]`

$\frac{1}{3}$

`Integrate[x^10 HeavisideTheta[1 - (x^2 + y^2)], {x, -1, 1}, {y, -1, 1}]`

$\frac{21\pi}{512}$

`NIntegrate[$\frac{1}{\sqrt{\frac{x_1}{3} + \frac{x_2}{2} + \frac{x_3}{2} + \frac{x_4}{10}}}$, {x1, 0, 1}, {x2, 0, 1}, {x3, 0, 1}, {x4, 0, 1}]`

1.2391