202001555 지은미

In [2]:
```
from IPython.core.interactiveshell import InteractiveShell
InteractiveShell.ast_node_interactivity="all"

import numpy as np
```

In [8]:
```
#02

def g(x):
    return x**3 + x

def f(v):
    x = v[0]
    y = v[1]
    z = v[2]
    return z * x - 3*(x**2)*(y**3)*(z**4)

def d(f, v, i):
    h = 1e-10
    w = [v_j + (h if j == i else 0) for j, v_j in enumerate(v)]
    return (f(w)-f(v))/h

#(1)
#dfdx = z - 6*x*(y**3)*(z**4)

#(2)
#dfdy = - 9*(x**2)*(y**2)*(z**4)

#(3)
#dfdz = x - 12*(x**2)*(y**3)*(z**3)
```

In [ ]:
```
#(4)
```

$x=1, \quad z=1$

$$df/dx = z - 6xy^3z^4$$

$$= z - 6x(x^3+x)^3z^4$$

$$= 1 - 6(1+1)^3 \cdot 1$$

$$= 1 - 48$$

$$= -47$$

In [4]:
```
#(5)
```

$x=1, z=1$

$$df/dg = -9x^2y^2z^4$$

$$= -9x^2(x^2+x)^2z^4$$

$$= -9\cdot 1(1+1)^2\cdot 1$$

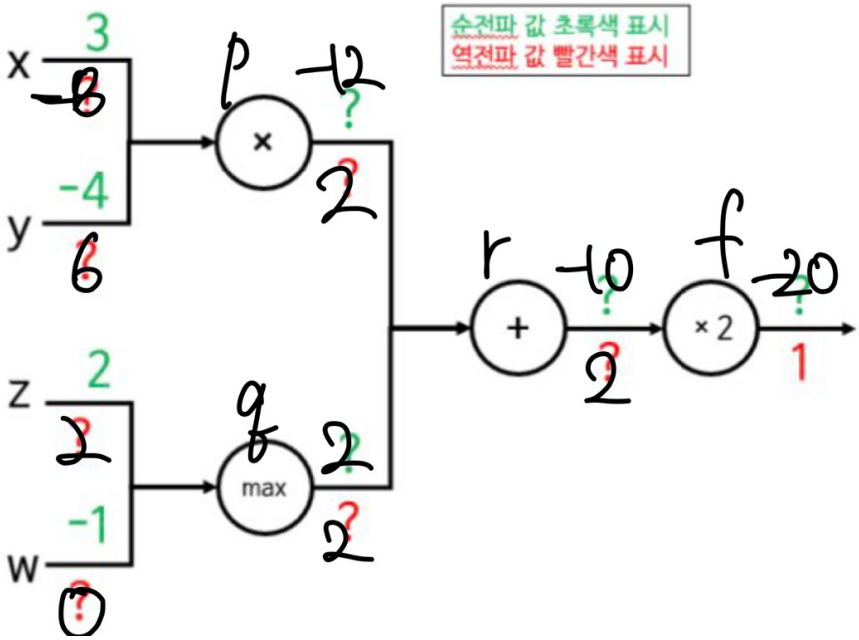
$$= -36$$

In [5]:
```
#(6)
v = [1, g(1), 1]

d(f, v, 1)
```

Out[5]: -36.000002978653356

In [6]:
```
#03-1
```



In [7]:
```
#03-2
x=3
y=-4
z=2
w=-1

#순전파
p=x*y
q=max(z,w)
r=p+q
f=r*2
print("p=",p)
print("q=",q)
print("r=",r)
print("f=",f)

#역전파
dfdr=2
print("dfdr=",dfdr)

drdp=1
drdq=1
dfdp=dfdr*drdp
dfdq=dfdr*drdq
print("dfdp=",dfdq)
print("dfdq=", dfdq)

dpdx=y
dpdy=x
dfdx=dfdp*dpdx
dfdy=dfdp*dpdy
print("dfdx=",dfdx)
print("dfdy=", dfdy)

if(z>=w):   #q=z
    dqdz=1
    dqdw=0
else:       #q=w
    dqdz=0
    dqdw=1

dfdz=dfdq*dqdz
dfdw=dfdq*dqdw
print("dfdz=",dfdz)
print("dfdw=",dfdw)
```

```
p= -12
q= 2
r= -10
f= -20
dfdr= 2
dfdp= 2
dfdq= 2
dfdx= -8
dfdy= 6
dfdz= 2
dfdw= 0
```

In [12]:
```
#04
def sigmoid(x):
    return 1/(1+np.exp(-x))


def forward_propagation(i,w):
    x=np.dot(w,i)
```

```
    o=sigmoid(x)
    return o

def back_propagation(w,e):
    w_sum=w.sum(axis=1, dtype="float")
    e_divide=w.T/w_sum
    e_result=np.dot(e_divide,e.T)
    return e_result

def weight_update(w,o,e,study):
    weight_sum=np.dot(w,o)
    sig=sigmoid(weight_sum)*(1-sigmoid(weight_sum))
    m=np.dot(-e*sig,o.T)
    result=w-(study*m)
    return result

i_input = np.array([0.4,0.5],ndmin=2).T
i_input
w_input_output = np.array([[2.0,3.0],[1.0,4.0]])
w_input_output

#04-1
#순전파
output_forward = forward_propagation(i_input,w_input_output)
print("output_forward")
output_forward

#04-2
#역전파
target=np.array([1.70887704,1.4168273],ndmin=2).T
print("target")
target
error = abs(target-output_forward)
print("error")
error
back_input = back_propagation(w_input_output,error.T)
print("back_input")
back_input

#04-3
study=0.1
weight_input_output=weight_update(w_input_output,output_forward,error,study)
print("weight_input_output")
weight_input_output
```

```
Out[12]: array([[0.4],
                [0.5]])
```

```
Out[12]: array([[2., 3.],
                [1., 4.]])
output_forward
```

```
Out[12]: array([[0.90887704],
                [0.9168273 ]])
target
```

```
Out[12]: array([[1.70887704],
                [1.4168273 ]])
error
```

```
Out[12]: array([[0.8],
                [0.5]])
back_input
```

```
Out[12]: array([[0.42],
                [0.88]])
weight_input_output
```

```
Out[12]: array([[2.00073904, 3.00074551],
                [1.00045832, 4.00046233]])
```

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