In [3]:
```
# import libraries
import math
import sympy as sp

x = sp.Symbol('x')
```

1a. Use python code to evaluate f f(x) = 2x**3 - 4x + 1

In [10]:
```
# assign values close to 3
fx1 = 2
fx2 = 2.25
fx3 = 2.50
fx4 = 2.75
fx5 = 2.9999
```

In [13]:
```
# solve for f

fy1 = 2*fx1**3 - 4*fx1 + 1
fy2 = 2*fx2**3 - 4*fx2 + 1
fy3 = 2*fx3**3 - 4*fx3 + 1
fy4 = 2*fx4**3 - 4*fx4 + 1
fy5 = 2*fx5**3 - 4*fx5 + 1

print(fy1, fy2, fy3, fy4, fy5)
print("The closer we get to whole number 3, the closer we get to whole number
 43")
```

```
9 14.78125 22.25 31.59375 42.99500017999799
The closer we get to whole number 3, the closer we get to whole number 43
```

1b. use code to evaluate the function g g(x) = (e**2 - 1) / x

In [14]:
```
# assign values for x
e = math.e

gx1 = .2
gx2 = .1
gx3 = .01
gx4 = .001
gx5 = .0001
```

In [16]:
```
gy1 = (e**gx1 - 1) / gx1
gy2 = (e**gx2 - 1) / gx2
gy3 = (e**gx3 - 1) / gx3
gy4 = (e**gx4 - 1) / gx4
gy5 = (e**gx5 - 1) / gx5

print(gy1, gy2, gy3, gy4, gy5)
print("The limit is 1 as x approaches 0")
```

```
1.1070137908008493 1.0517091807564771 1.005016708416795 1.0005001667083846 1.
000050001667141
The limit is 1 as x approaches 0
```

1c. Could the limits be calculated by plugging in the value?

In [17]:
```
print("For 1a yes because you are working towards the limit but for 1b, no bec
ause 0 won't be accepted.")
```

```
For 1a yes because you are working towards the limit but for 1b, no because 0
won't be accepted.
```

1. Average rate of change (ARC) function for x = f(b)-f(a)/b-a

In [18]:
```
# define ARC function
def arc(x):
    return 3*x**2
```

In [20]:
```
# create function and input two numbers
def arc1(func, a, b):
    return(func(b) - func(a)) / (b-a)
print(arc1(arc, 2, 4))
```

```
18.0
```

1. Define the ARC of Instantaneous Rate of Change function f(t) = 4.9t**2

In [21]:
```
# define function for ARC IRC

def seconds(t):
    return 4.9*t**2
```

In [22]:
```
#3a. average speed of 5-6 seconds
print(arc1(seconds, 5, 6))
```

```
53.89999999999999
```

In [23]:
```
#3b. average speed of 5-5.5 seconds
print(arc1(seconds, 5, 5.5))
```

```
51.45000000000002
```

In [24]:
```
#3c. average speed of 5-5.1 seconds

print(arc1(seconds, 5, 5.1))
```

```
49.490000000000016
```

In [26]:
```
#3d. Instantaenous speeed at t=5
print(arc1(seconds, 4.9,5.1))
print(arc1(seconds, 4.9,5))
print("The average comes out to approx 49")
```

```
49.00000000000002
48.51000000000002
The average comes out to approx 49
```

In [29]:
```
#3e. Fine the derivative of f
# reference: https://dev.to/erikwhiting88/calculate-derivative-functions-in-python-h58

print(sp.diff(4.9*(x**2)))

def der(t):
    return 2*4.9*t
```

```
9.8*x
```

In [30]:
```
#3f. Evaluate the derivative of f @ t = 5

print('f.',der(5))
print("It's the same (49) because the instantaneous rate of change is at any given point")
```

```
f. 49.0
It's the same (49) because the instantaneous rate of change is at any given point
```

In [34]:
```
#4a. What is the models predicted selling rate
# p = 16000 + 2400C - 1800Y

p = 16000 + 2400*8 - 1800*5
print("The selling price would be $", p, "because it's 5 years old and a rating of 8")
```

```
The selling price would be $ 26200 because it's 5 years old and a rating of 8
```

In [35]:
```
#4b. partial of P/C
print("Partial is $2400 which is based on the condition of the vehicle")
```

```
Partial is $2400 which is based on the condition of the vehicle
```

In [37]:
```
#4c. partial if P/Y
print("Partial is less $1800 because the age of the vehicle decreases the value")
```

```
Partial is less $1800 because the age of the vehicle decreases the value
```