Assignment02

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```
In [1]: import numpy as np
        import matplotlib.pyplot as plt
        import random
        from sympy import *
        from scipy.misc import derivative
```

1 Define a differential function : $\frac{x}{e^x+1}$

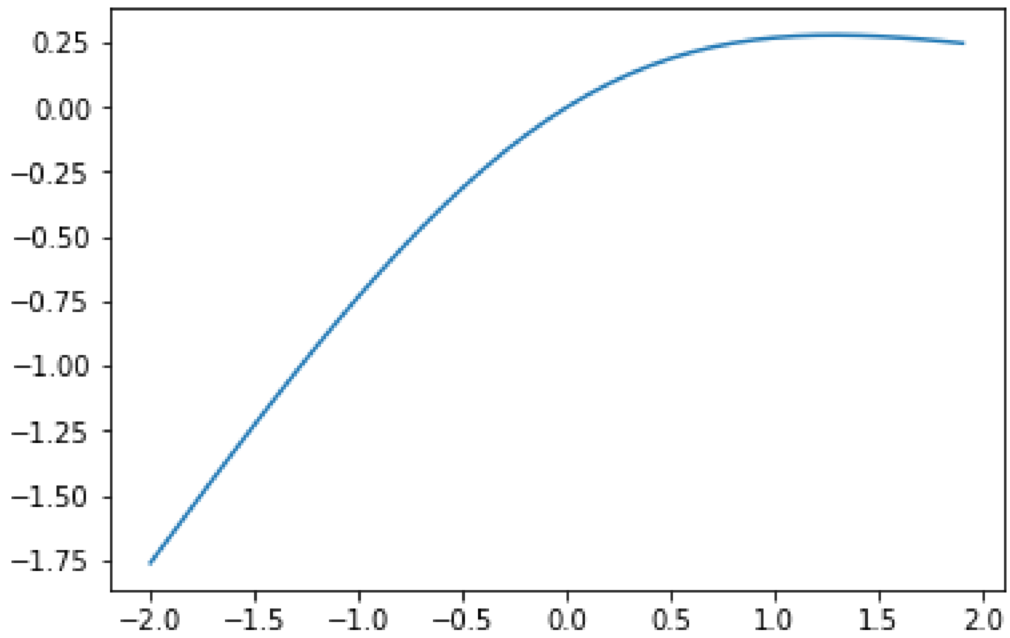
```
In [2]: def func(x) :
            function = x / (np.exp(x) + 1)
            return function
```

2 Define domain of the function: $ x = (-2, 2) $

```
In [3]: x = np.arange(-2, 2, 0.1)
```

3 Plot

```
In [4]: plt.plot(x, func(x))
        plt.show()
```



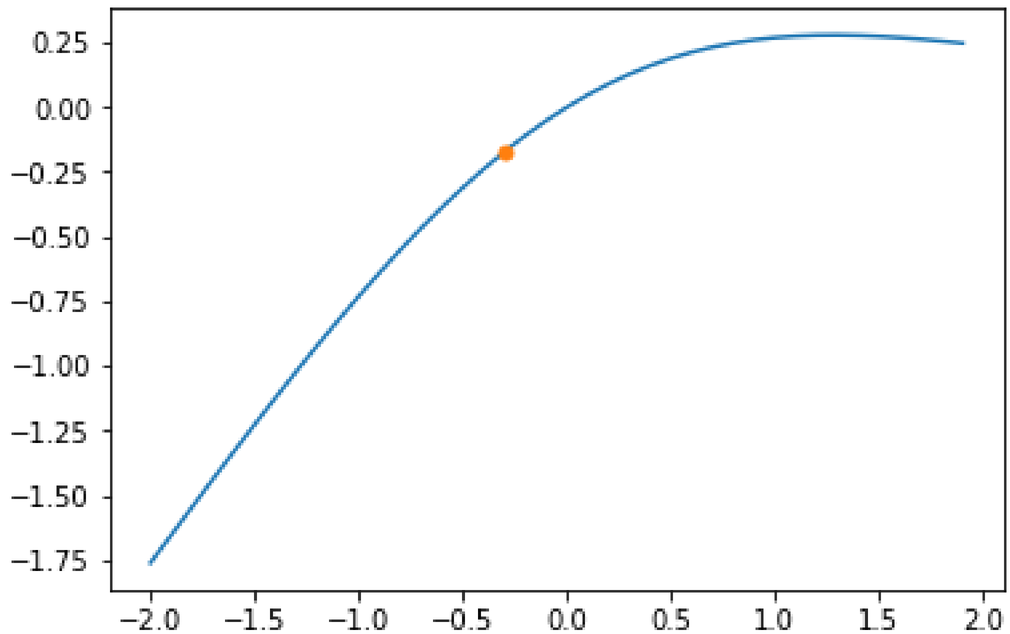
4 Select a point within the domain

```
In [5]: point = random.choice(x)
        point

Out[5]: -0.2999999999999985
```

5 Mark the selected point on the function

```
In [6]: plt.plot(x, func(x))
        plt.plot(point, func(point), marker='o', ms=5)
        plt.show()
```

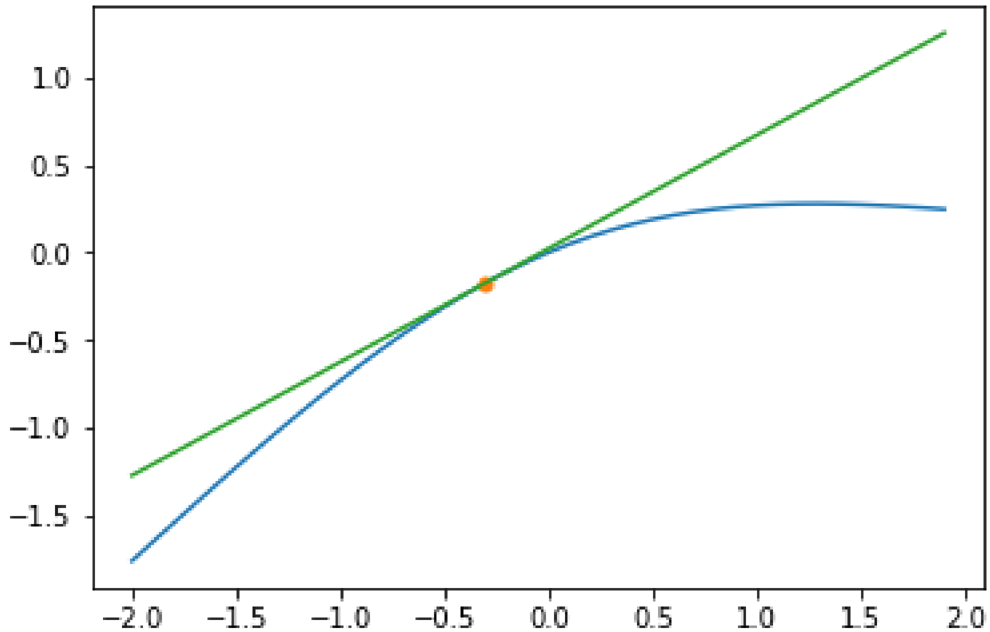


6 Define first-order Taylor approximation at the selected point

In [7]:
```
def taylor_approximation(domain, point) :
    taylor = func(point) + derivative(func, point, dx=1e-5)*(domain - point)
    return taylor
```

7 Plot Taylor approximation with the same domain of the original function

In [8]:
```
plt.plot(x, func(x))
plt.plot(point, func(point), marker='o', ms=5)
plt.plot(x, taylor_approximation(x, point))
plt.show()
```


1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5
2.0