Assignment02

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1 Information

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2 import library

```
In [3]: import numpy as np; import matplotlib.pyplot as plt
```

3 Define a differentiable function that maps from real number to real numbe

$f(x) = x^3 - 4x$

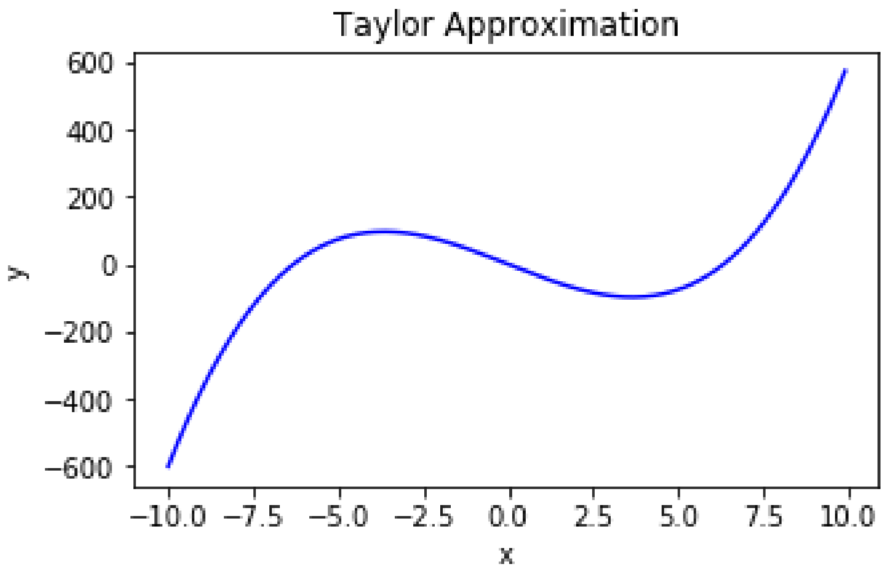
4 Define a domain of the function.

$-10 \leqq X \leqq 10$

```
In [4]: x = np.arange(-10, 10, 0.1); y = x*x*x - 40*x
```

5 Plot the function.

```
In [5]: plt.figure(figsize=(5, 3));plt.plot(x, y, color='blue');
        plt.title('Taylor Approximation'); plt.xlabel('x'); plt.ylabel('y');
```

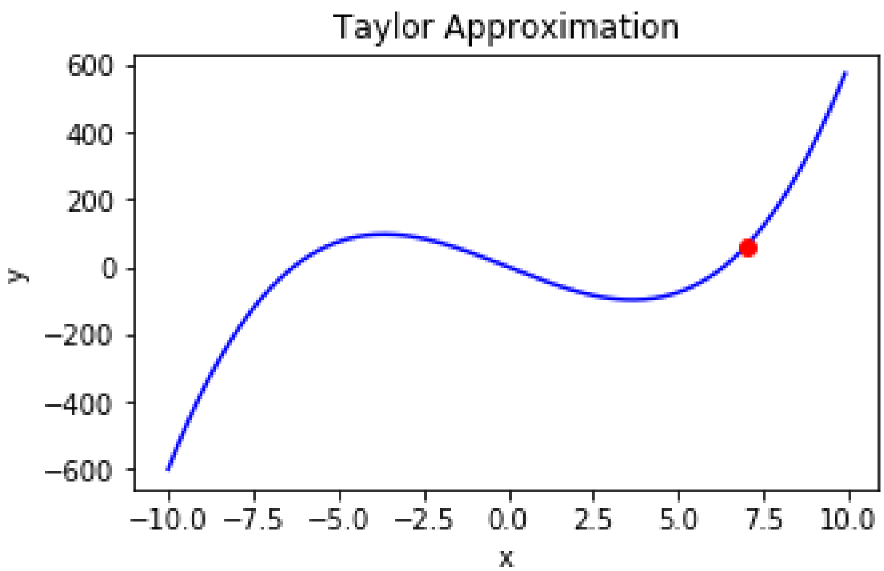


6 Select a point within the domain.

```
In [6]: p = 7; m = p*p*p - 40*p
```

7 Mark the selected point on the function.

```
In [17]: plt.figure(figsize=(5, 3));plt.plot(x, y, color='blue'); plt.plot(p, m, 'ro');
         plt.title('Taylor Approximation'); plt.ylabel('y');plt.xlabel('x');
```



8 Define the first-order Taylor approximation at the selected point.

$\hat{f}(x) \; = f(z) \; + \frac{\partial f}{\partial x}(z)(x - z)$

```
In [9]: fh = (p*p*p - 40*p) + (3*p*p - 40)*(x - p)
```

9 Plot the Taylor approximation with the same domain of the original function.

```
In [16]: plt.figure(figsize=(5, 3));plt.plot(x, y, color='blue'); plt.plot(x, fh, color='green
         plt.title('Taylor Approximation');plt.xlabel('x'); plt.ylabel('y');
```