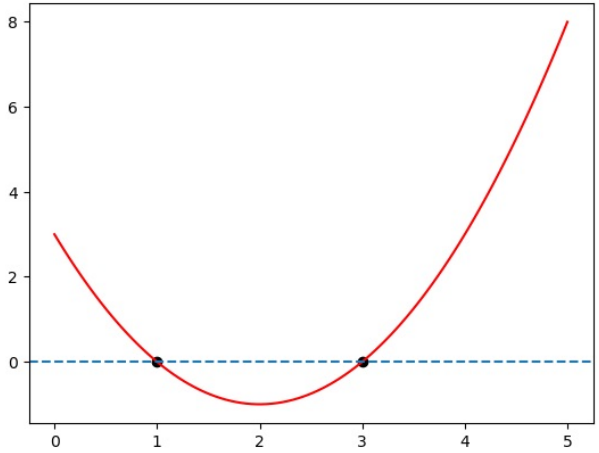
$\frac{dx}{dt} = y^2 - 4y + 3 = 0$

$(y-3)(y-1) = 0$

$y = 3, \; y = 1$

fixed points



$\frac{d}{dy}(y^2 - 4y + 3) = 2y - 4$

at fixed points $x = 3, \; x = 1$

$\frac{d}{dy}\left(\frac{dy}{dt}(3)\right) = 2(3) - 4$
$= 6 - 4$
$= 2$

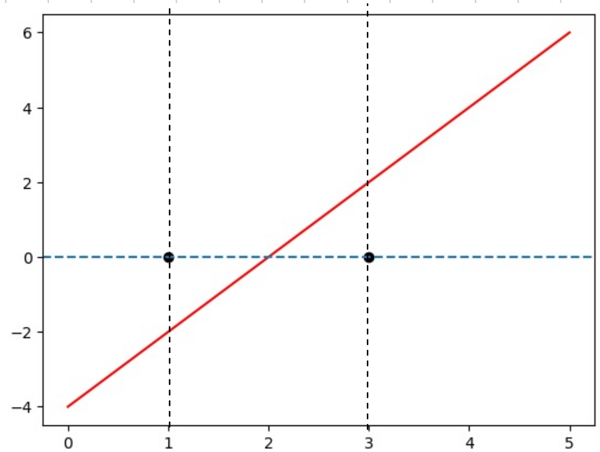
$2 > 0$

$x = 3$ is unstable

$\frac{d}{dy}\left(\frac{dy}{dt}(1)\right) = 2(1) - 4$
$= -2$

$-2 < 0$

$x = 1$ is stable



the graph depicts the derivative of the differential equation and shows us that at the fixed point x = 1 the derivative is negative meaning its a stable point compared to x = 3 being positive making it unstable

```python
import numpy as np
import matplotlib.pyplot as plt

import sympy as sp
```
[9] ✓ 0.2s

```python
y=sp.symbols("y")
dydt=y**2-4*y+3


zeros = sp.solve(dydt, y)
print("fixed points:",zeros)
```
[10] ✓ 0.0s

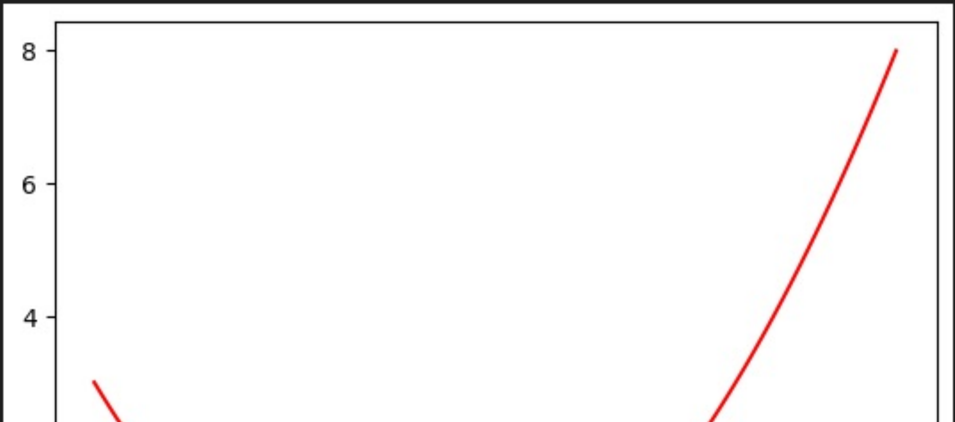
```
fixed points: [1, 3]
```

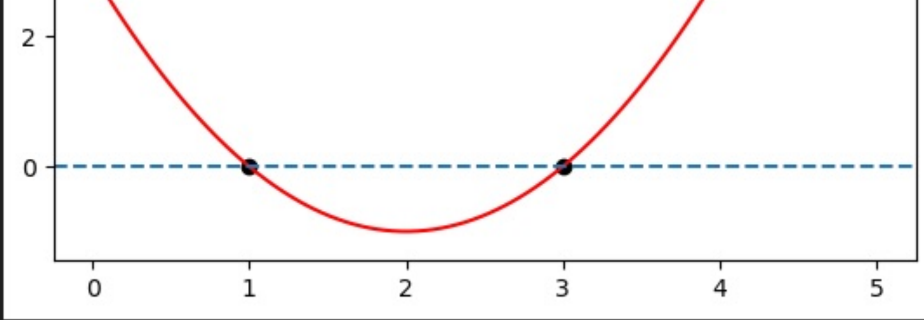
```python
t_0, t_f, step = 0, 5, 100

y_p = np.linspace(t_0, t_f, step)
dy = y_p**2-4*y_p+3


plt.plot(y_p, dy, label=r'$\frac{dy}{dt} = y^2 - 4y + 3', color='red')
plt.axhline(y=0, linestyle='--')
plt.scatter(zeros, [0,0], color='black')

plt.show()
```
[29] ✓ 0.0s






```
diff = sp.diff(dydt, y)
print(f"derivative: {diff}")
```

[32] ✓ 0.0s

```
derivative: 2*y - 4
```

```
fx=2*y_p-4

plt.plot(y_p, fx, color='red')
plt.axhline(y=0, linestyle='--')
plt.scatter(zeros, [0,0], color='black')

plt.show()
```

[33] ✓ 0.0s