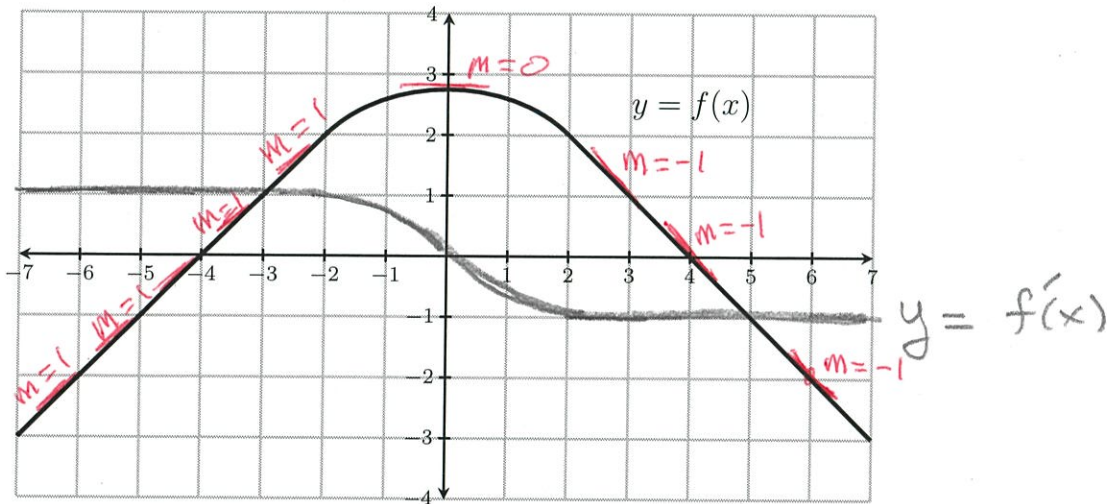


1. (7 pts.) Find all values of x at which the tangent line to $f(x) = 2 + e^x - x$ is horizontal.

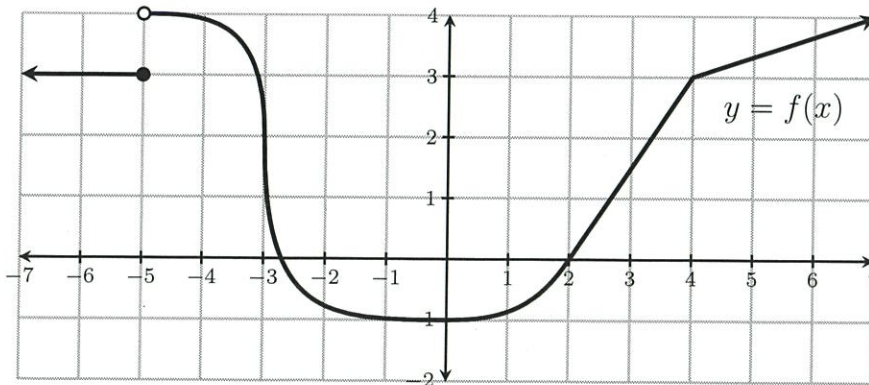
Need to solve $f'(x) = 0$
 $0 + e^x - 1 = 0$
 $e^x = 1$
 $\ln(e^x) = \ln(1)$
 $x = 0$

Tangent line to $y = f(x)$ is horizontal only at $x = 0$

2. (7 pts.) The graph of a function $f(x)$ is shown below. Using the same coordinate axis, sketch the graph of its derivative $f'(x)$



3. (6 pts.) This problem concerns the function $f(x)$ sketched below.



vertical tangent cusp

- (a) State the x -values at which f is not continuous.

$x = -5$

- (b) State the x -values at which f is not differentiable.

$x = -5, x = -3, x = 4$

f not continuous

1. (7 pts.) Find all values of x at which the tangent line to $f(x) = \frac{x}{e} - e^x$ is horizontal.

Need to solve $f'(x) = 0$

$$\frac{1}{e} - e^x = 0$$

$$e^x = \frac{1}{e}$$

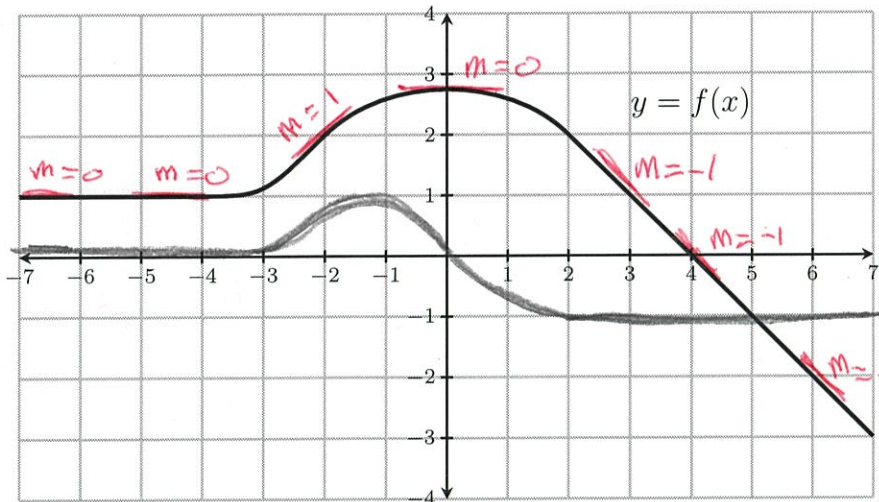
$$\ln(e^x) = \ln\left(\frac{1}{e}\right)$$

$$x = -1$$

$f(x) = \frac{1}{e}x - e^x$

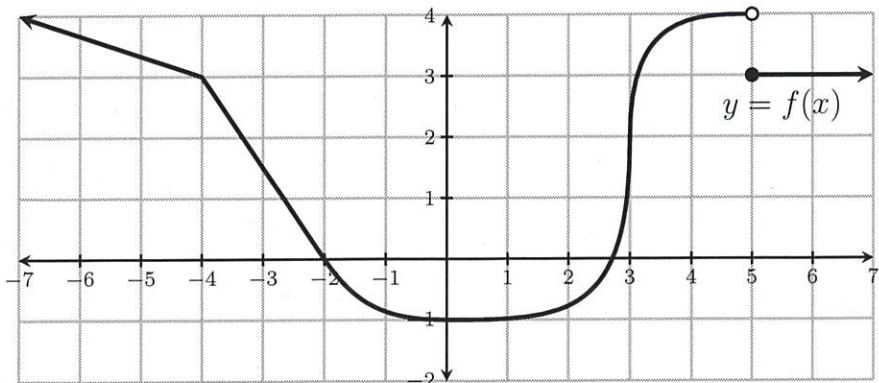
Tangent line to $y = f(x)$ is horizontal only at $x = -1$

2. (7 pts.) The graph of a function $f(x)$ is shown below. Using the same coordinate axis, sketch the graph of its derivative $f'(x)$



$y = f'(x)$

3. (6 pts.) This problem concerns the function $f(x)$ sketched below.



f not continuous

(vertical tangent)

$x = 5$

$x = -4, x = 3, x = 5$

CUSP

(a) State the x -values at which f is not continuous.

(b) State the x -values at which f is not differentiable.