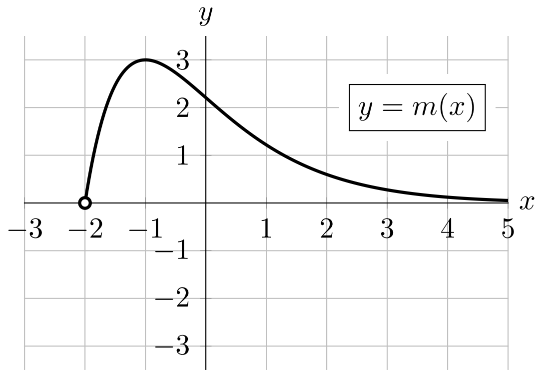
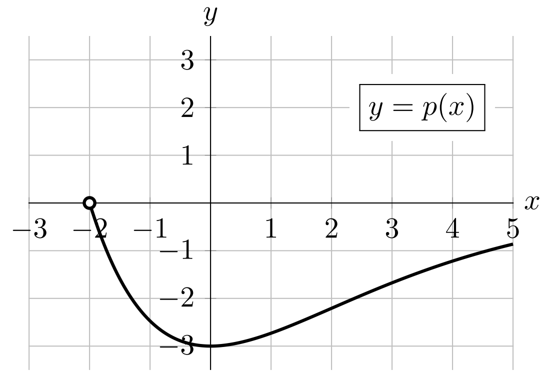
6. [4 points] Shown below at left is a portion of the graph of a function $m(x)$. Shown below at right is a portion of the graph of a function $p(x)$, which can be obtained from $m(x)$ through one or more graph transformations. Find a formula for $p(x)$ in terms of $m(x)$.





Answer: $p(x) = -m\left(\frac{1}{2}x - 1\right) = -m\left(\frac{1}{2}(x-2)\right)$

7. [9 points] For a constant c, let

$$K(x) = \frac{2^{cx}}{e^{x-c}}.$$

a. [5 points] Use the limit definition of the derivative to write an explicit expression for $K'(3)$. *Your answer may include the constant c but should not involve the letter K. Do not attempt to evaluate or simplify the limit.* Write your final answer in the answer box provided below.

Answer: $K'(3) = \lim_{h\to 0} \dfrac{\dfrac{2^{c(3+h)}}{e^{(3+h)-c}} - \dfrac{2^{c(3)}}{e^{3-c}}}{h}$

b. [4 points] Find the value of c so that $K(1) = 5$. Give your answer in **exact form** and show all your work.

Solution: We want c such that

$$\frac{2^{c(1)}}{e^{1-c}} = 5, \text{ or}$$
$$2^c = 5e^{1-c}.$$

Solving, we find that

$$\ln(2^c) = \ln\left(5e^{1-c}\right)$$
$$\ln(2^c) = \ln(5) + \ln\left(e^{1-c}\right)$$
$$c\ln(2) = \ln(5) + 1 - c$$
$$c\ln(2) + c = \ln(5) + 1$$
$$c(\ln(2)+1) = \ln(5) + 1$$
$$c = \frac{\ln(5)+1}{\ln(2)+1}.$$

Answer: $c = \dfrac{\ln(5)+1}{\ln(2)+1}$