2. [10 points]

a. [5 points] Let $f(x)$ be a function that satisfies all of the following statements:

a) The domain of $f(x)$ is $[-4, 5)$.

b) The graph of $y = f(x)$ has only one horizontal intercept at $x = 2$.

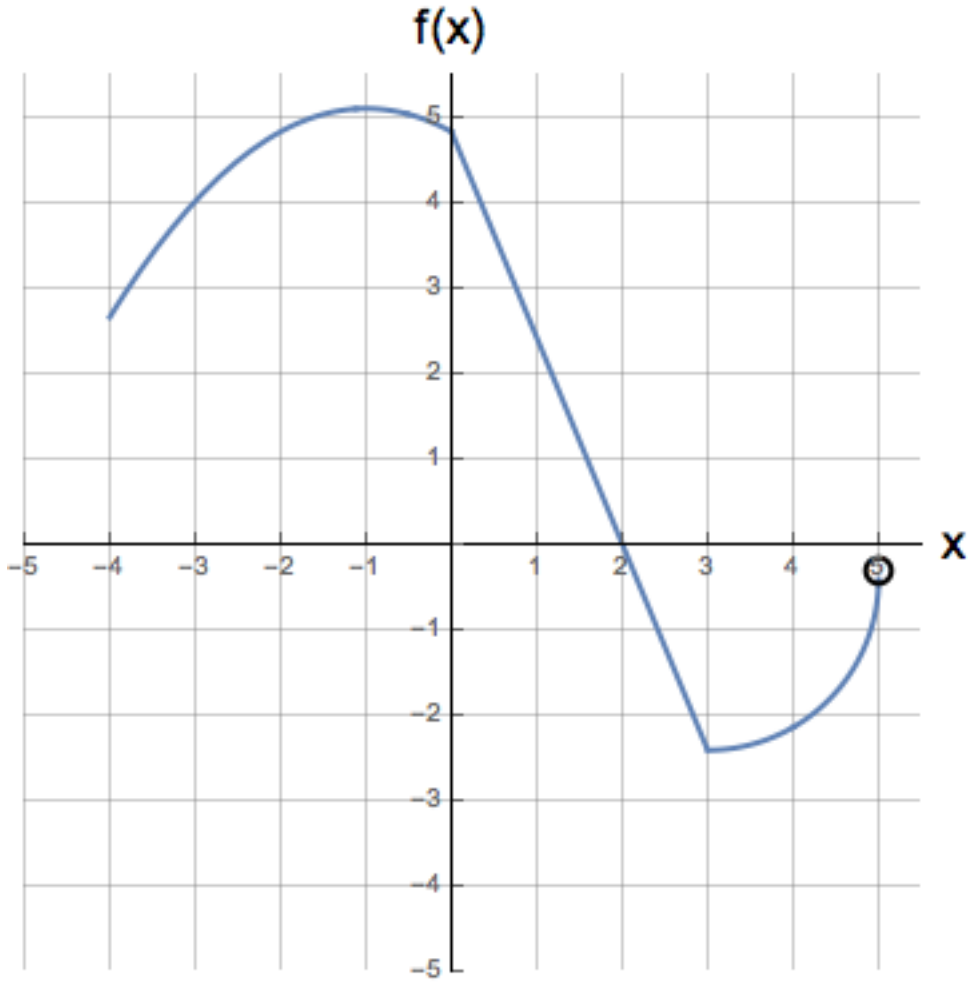
c) The function $f(x)$ is decreasing for $-1 \leq x \leq 3$.

d) The function $f(x)$ is concave down for $-4 \leq x \leq 0$ and concave up for $3 \leq x < 5$. Make sure the concavity of $f(x)$ is clear in your graph.

e) The function $f(x)$ has constant rate of change for $0 \leq x \leq 3$.

Draw a possible graph for $f(x)$. Make sure to label the important points on the graph to receive full credit.

Solution:



b. [5 points] Let $w = K(r)$, where $K(r) = \log\left(7e^{2r} + 4\right) + 5$. Find a formula for $K^{-1}(w)$. Show all your work.

Solution:

$$\begin{aligned} w &= \log\left(7e^{2r} + 4\right) + 5 \\ w - 5 &= \log\left(7e^{2r} + 4\right) \\ 10^{w-5} &= 7e^{2r} + 4 \\ 7e^{2r} &= 10^{w-5} - 4 \\ e^{2r} &= \frac{10^{w-5} - 4}{7} \\ 2r &= \ln\left(\frac{10^{w-5} - 4}{7}\right) \\ K^{-1}(w) &= \frac{1}{2}\ln\left(\frac{10^{w-5} - 4}{7}\right) \end{aligned}$$