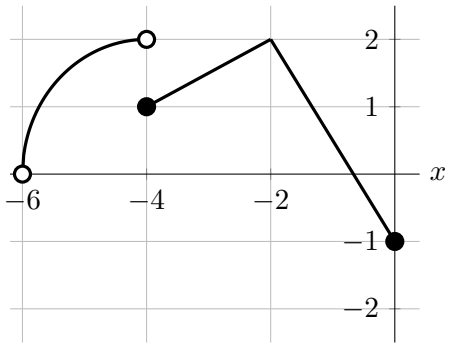
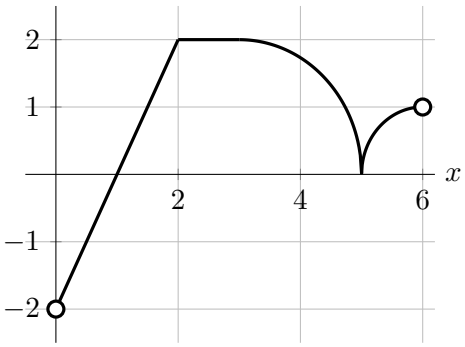
6. [14 points] The function $f(x)$ is defined on the interval $-6 < x < 6$. The graphs of $f(x)$ and its derivative $f'(x)$ are shown below on the intervals $(-6, 0]$ and $(0, 6)$ respectively. All the graphs consist of line segments and quarters of circles.

$y = f(x)$



$y = f'(x)$



The function $f(x)$ is continuous at $x = 0$. In the following questions, your answers must be **exact**. If any of the answers are undefined write "UND". If there is not enough information to answer a question, write "NEI"

a. [2 points] Find $\lim_{x \to 4^+} (5f(-x) + 3)$.

Solution: **Answer:** 13

b. [2 points] Find $\lim_{x \to -\infty} f(-4 - 2^x)$.

Solution: **Answer:** 2

c. [2 points] On which interval(s) in $-6 < x < 6$ is the function $f(x)$ is decreasing?

Solution: **Answer:** $[-2, 1]$.

d. [3 points] At which value(s) of $-6 < x < 6$ is the function **not** differentiable?

Solution: **Answer:** $x = -4, -2, 0$.

e. [3 points] Find the coordinates (x, y) of the global maximum of $f(x)$ for $0 \leq x \leq 5$. Show your work.

Solution: Global maximum at $x = 5$ and its y-coordinate is equal to

$$f(5) = -1 + \int_0^5 f'(x)dx = -1 + 2 + \frac{1}{4}\pi(2)^2 = 1 + \pi$$

Answer: $x = 5 \quad y = 1 + \pi$.

f. [2 points] At which value(s) of $-6 < x < 6$ does the function $f(x)$ have an inflection point?

Solution: The only point where the function $f(x)$ changes concavity is at $x = 5$.
Answer: $x = 5$