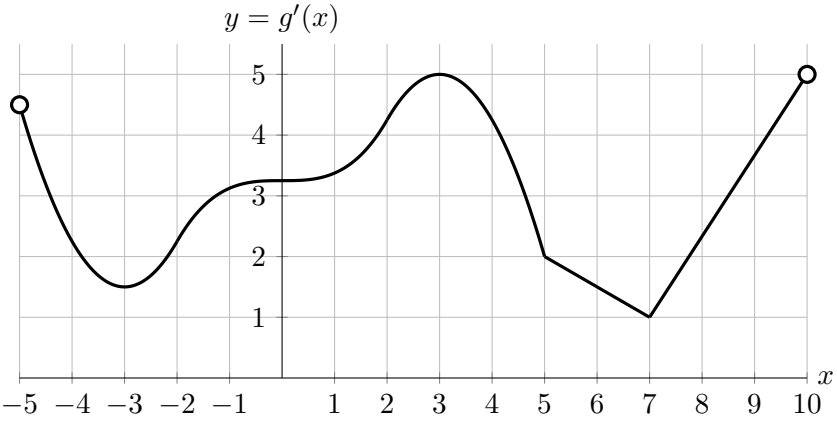
8. [14 points] The graph of the **derivative** $g'(x)$ of the function $g(x)$ with domain $-5 < x < 10$ is shown below.

The function $g'(x)$ has corners at $x = 5$ and $x = 7$, and it is linear on the intervals $(5, 7)$ and $(7, 10)$.

If there is not enough information given to answer the question, write "NEI". If the answer is none, write "NONE".



a. [3 points] Estimate the interval(s) on which the function $g(x)$ is concave up.

Solution: **Answer:** (-3,3) and (7,10)

b. [3 points] Estimate all the x-coordinates of the inflection points of $g(x)$.

Solution: **Answer:** $x = -3, 3, 7$.

c. [2 points] Estimate the values of x in $-5 < x < 10$ for which $g''(x)$ is not defined.

Solution: **Answer:** $x = 5, 7$.

d. [2 points] Estimate the interval(s) on which $g'''(x) > 0$. Recall that $g'''(x)$ is the derivative of $g''(x)$.

Solution: **Answer:** (approximately) $(-5, -2)$ and $(0, 1.8)$.

e. [4 points] Let $P(x)$ be the quadratic approximation of $g(x)$ at $x = 8$. Find the formula of $P(x)$ in terms of only the variable x if $g(8) = -2$. Your answer should not include the letter g.

Solution: $g(8) = -2$, $g'(8) = 1 + \frac{4}{3} = \frac{7}{3}$ and $g''(8) = \frac{4}{3}$. Then

Answer: $P(x) = -2 + \frac{7}{3}(x - 8) + \frac{2}{3}(x - 8)^2$