In this quiz you can use only pencils and erasers.

Show your work in detail, unless only an answer is required. Correct answer without proper explanation does not receive any partial credits.
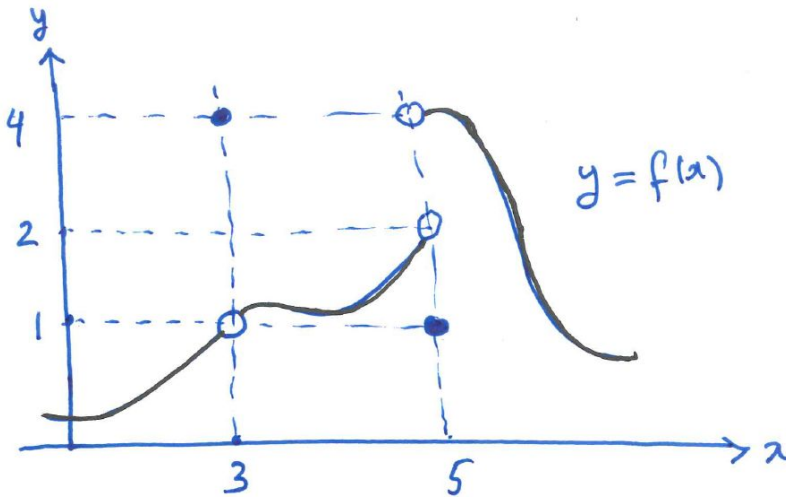
Q-1)

Fill in the following boxes using the above graph. If something asked does not exist, write "dne".

$$f(3) = \boxed{4} \;,\; \lim_{x \to 3^-} f(x) = \boxed{1} \;,\; \lim_{x \to 3^+} f(x) = \boxed{1} \;,\; \lim_{x \to 3} f(x) = \boxed{1}.$$

$$f(5) = \boxed{1} \;,\; \lim_{x \to 5^-} f(x) = \boxed{2} \;,\; \lim_{x \to 5^+} f(x) = \boxed{4} \;,\; \lim_{x \to 5} f(x) = \boxed{dne}.$$

: Grading is 5 points for each correct box.

The next question is on the other side of the paper.

Q-2) Consider the function $g(x) = x^2 + 5x - 7$.

1. Calculate $\lim\limits_{\Delta x \to 0} \dfrac{g(3 + \Delta x) - g(3)}{\Delta x}$.

2. Write the equation of the tangent line to the curve $y = g(x)$ at the point $x = 3$.

: Grading is 30+30 points.

Answer:

$$
\begin{aligned}
\lim\limits_{\Delta x \to 0} \frac{g(3 + \Delta x) - g(3)}{\Delta x} &= \lim\limits_{\Delta x \to 0} \frac{((3 + \Delta x)^2 + 5(3 + \Delta x) - 7) - (17)}{\Delta x} \\
&= \lim\limits_{\Delta x \to 0} \frac{11\Delta x + (\Delta x)^2}{\Delta x} \\
&= \lim\limits_{\Delta x \to 0} (11 + \Delta x) \\
&= 11.
\end{aligned}
$$

The equation of the tangent line is then

$$y - 17 = 11(x - 3), \quad \text{or} \quad y = 11x - 16,$$

where $17 = g(3)$.