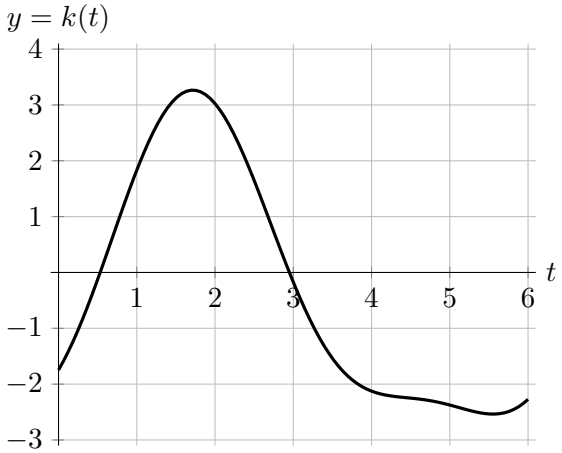
3. [8 points] A group of biologists is studying the population of trout in a lake. Let $k(t)$ be the rate at which the population of trout changes, in thousands of trout per month, t months after the biologists started their study, and let $P(t)$ be the population of trout, in thousands, t months after the study begins. The graph of $y = k(t)$ is shown below for $0 \le t \le 6$.



a. [4 points] Fill in the numbers I. - V. in the blanks below to list the quantities in order from least to greatest.

I. The number zero.

II. $P(4) - P(1)$

III. $\displaystyle\int_1^3 k(t)\,dt$

IV. $\displaystyle\int_3^5 k(t)\,dt$

V. $\displaystyle\int_3^5 k(5)\,dt$

_____ $\le$ _____ $\le$ _____ $\le$ _____ $\le$ _____

b. [3 points] Suppose $P(2) = 8.6$. Use the graph to find a formula for $L(t)$, the linear approximation for $P(t)$ near $t = 2$.

Answer: $L(t) =$ _____

c. [1 point] Use $L(t)$ to approximate the population of trout, in thousands, 1.75 months after the study starts.

Answer: _____