**Quiz 1.** *True/False*: The expression $12 \div 6 \cdot 2 + (-1)^3$ is the same as $\frac{12}{6\cdot 2} + (-1)^3$ and both are equal to $0$.

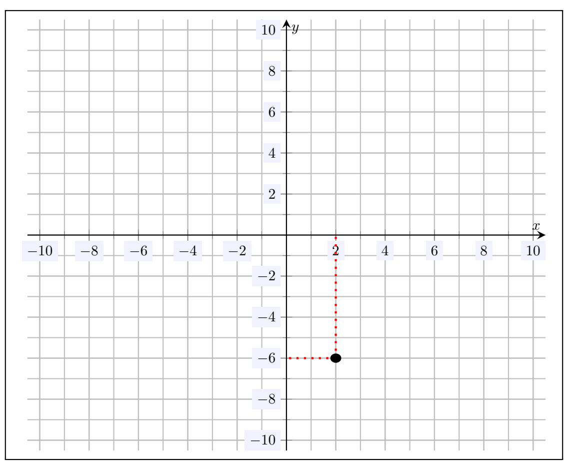
**Solution.** The statement is *false*. We can compute both, following order of operations (PEMDAS, applied carefully left-to-right), and show that the expressions evaluate to different values:

$$\begin{array}{cc}
12 \div 6 \cdot 2 + (-1)^3 & \frac{12}{6\cdot 2} + (-1)^3 \\
12 \div 6 \cdot 2 - 1 & \frac{12}{6\cdot 2} - 1 \\
2 \cdot 2 - 1 & \frac{12}{12} - 1 \\
4 - 1 & 1 - 1 \\
3 & 0
\end{array}$$

For these two expressions to be the same, the first needs a set of parentheses around the $6 \cdot 2$: $12 \div (6 \cdot 2) + (-1)^3$.

**Quiz 2.** *True/False*: The point $(2, -6)$ is in the third quadrant and is a distance of 2 away from the $x$-axis and a distance of $6$ away from the $y$-axis.

**Solution.** The statement is *false*. Because $x = 2 > 0$ and $y = -6 < 0$, the point $(2, -6)$ is in Quadrant IV. Moreover, plotting the point $(2, -6)$, we can see that the point is a distance of $|2| = 2$ away from the $x$-axis and a distance of $|-6| = 6$ away from the $y$-axis.

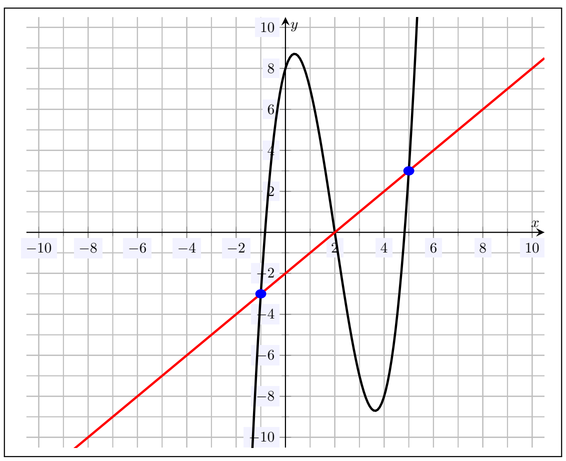



**Quiz 3.** *True/False*: The average rate of change of a function is the quotient of the change in output by the change in input. If the average rate of change is positive, the function increased. If the average rate of change is negative, the function decreased.

**Solution.** The statement is *true*. We know that the average rate of change of a function $f(x)$ over the interval $[a, b]$ is given by $\frac{f(b)-f(a)}{b-a}$. Because $x$'s are the inputs and $f(x)$'s are the outputs, this is $\frac{\Delta\text{output}}{\Delta\text{input}}$. Now because $b > a$, we know that $b - a > 0$. So the sign of the average rate of change depends only on the sign of $f(b) - f(a)$. If $f(b) - f(a) > 0$, then $f(b) > f(a)$. But then the function increased in value from the value at $x = a$ to the value at $x = b$. If $f(b) - f(a) < 0$, then $f(b) < f(a)$. But then the function decreased in value from the value at $x = a$ to the value at $x = b$. Neither imply that the function was increasing or decreasing, respectively, over the *entire* interval $[a, b]$.

**Quiz 4.** *True/False*: The average rate of change of a function $f(x)$ on an interval $[a, b]$ is the slope of the secant through the points $\big(a, f(a)\big)$ and $\big(b, f(b)\big)$.

**Solution.** The statement is *true*. We know that the average rate of change of a function $f(x)$ over the interval $[a, b]$ is given by $\frac{f(b)-f(a)}{b-a}$. Given the points $\big(a, f(a)\big)$ and $\big(b, f(b)\big)$, the slope of the line through them is $m = \frac{\Delta y}{\Delta x} = \frac{f(b)-f(a)}{b-a}$.




**Quiz 5.** *True/False*: If $P(t) = 5300t - 1480$ is a linear model representing the population in a small town $t$ years from now, then $m = 5300 > 0$ means that the model says that the population is growing at a rate of 5,300 people per year. Furthermore, the $y$-intercept $b = 1480$ represents the exact initial population of the town.

**Solution.** The statement is *false*. We know that the function $P(t)$ is linear, i.e. the graph of $P(t)$ is a line. We know that $m = 5300$. Recalling that $m = \frac{\Delta P}{\Delta t}$ and writing $5300 = \frac{5300}{1}$, we can see that for every one increase in $t$ results in a 5300 increase in $P$, i.e. the population is growing at a rate of 5,300 people per year. Of course, this is just what the model says happens, on average. The $y$-intercept is $P(0) = 5300(0) - 1480 = -1480$. But then $b \neq 1480$. Because $b = P(0) = -1480 < 0$, this cannot possibly represent a population. Furthermore, $b = P(0)$ need not represent the *exact* initial population, merely what the model predicts is the initial population.

**Quiz 6.** *True/False*: The line $y = 5 - 3x$ and the line through $(0, 5)$ with slope $-3$ must be the same line.

**Solution.** The statement is *true*. There is a unique line with a specified slope through any point, i.e. all that is needed to determine a line is a point and a slope. The line $y = 5 - 3x$ has slope

$-3$. Furthermore, because $5 - 3(0) = 5$, the line $y = 5 - 3x$ contains the point $(0, 5)$. Therefore, these lines must be the same. Alternatively, we can find the line through $(0, 5)$ with slope $-3$ using the point-slope form: $y = y_0 + m(x - x_0) = 5 - 3(x - 0) = 5 - 3x$. One can also use the fact that $(0, 5)$ is a $y$-intercept so that this forces $b = 5$. Because the line has slope $-3$, we must have $y = -3x + 5 = 5 - 3x$. In either case, both lines are $y = 5 - 3x$.

**Quiz 7.** *True/False*: The quadratic function $f(x) = 5 - (x + 6)^2$ opens upwards and has vertex $(6, 5)$.

**Solution.** The statement is *false*. Recall that the vertex form of a quadratic function is $a(x - P)^2 + Q$, where $a$ is the $a$ from the standard form $ax^2 + bx + c$ and $(P, Q)$ is the vertex. We have $f(x) = 5 - (x + 6)^2 = -\big(x - (-6)\big)^2 + 5$. Therefore, $a = -1 < 0$ so that the quadratic function opens downwards. Furthermore, the vertex is $(-6, 5)$. The given solution incorrectly identifies the $a$-value and vertex.