1. Use the table of values for the functions $k$, $\ell$ and $m$ below to find the following values.

| $t$ | 0 | 1 | 2 | 3 | 4 |
|-----|---|---|---|---|---|
| $k(t)$ | 4 | 3 | 2 | 1 | 0 |
| $\ell(t)$ | 3 | 1 | 4 | 0 | 2 |
| $m(t)$ | 2 | 0 | 4 | 1 | 3 |

    (a) $\ell(m(0))$

    (b) $m(k(3))$

    (c) $k(k(2))$

    (d) $k(\ell(m(4)))$

    (e) $m(m(m(2)))$

2. Consider a line though the points $(2, 5)$ and $(4, 7)$.

    (a) Find the slope of the line.

    (b) Find the equation of the line in any form.

    (c) Find the $x$-intercept of this line.

3. The rate of change of a population of algae, $A'$, is proportional to 3 less than the population $A$.

    (a) Write an equation relating $A'$ and $A$. Your equation will involve a constant of proportionality, $k$.

    (b) The rate of change of the population is 10 algae per day when there are 20 algae present. Find $k$. What are the correct units for $k$?

    (c) What is the rate of change of the algae population when there are 50 algae? Please provide the correct units with your answer.

4. Find $g'(1)$ if $g(x) = 100$.

5. Find the slope of the *secant* line to the graph of $h(x) = x^2 + 10$, through the points $x = 0$ and $x = 5$.

6. Consider a quantity $F$ whose graph appears below.
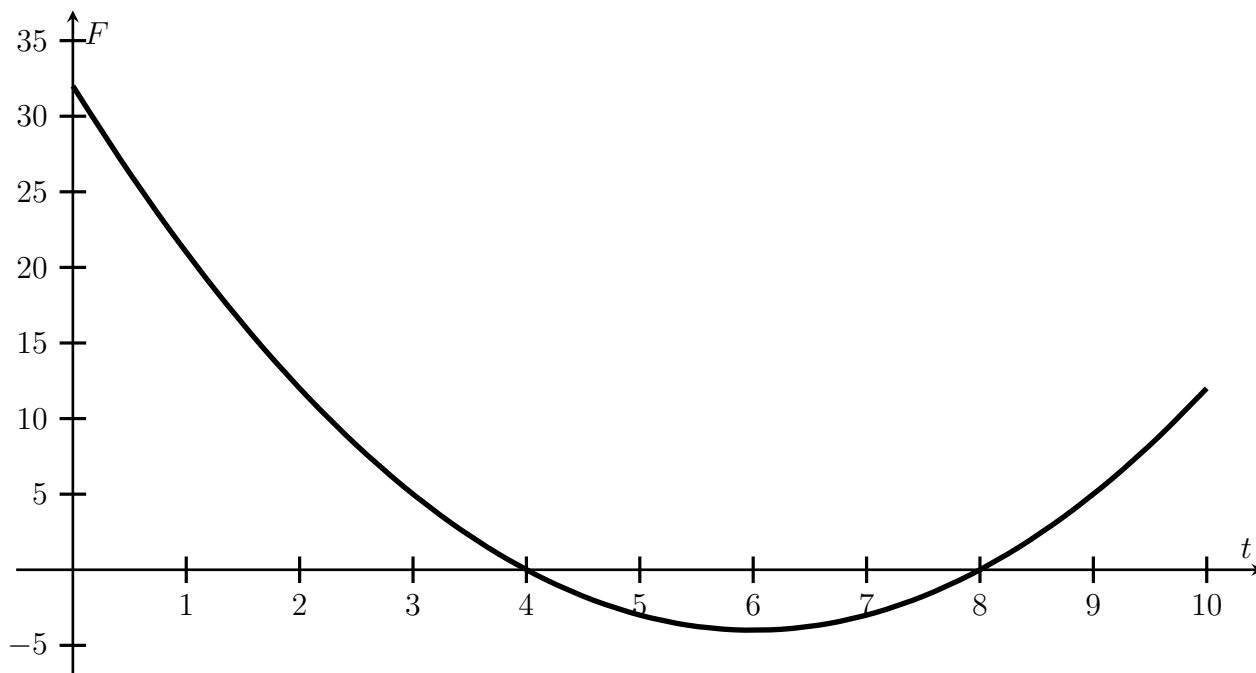
(a) Where (for which values of $t$) is $F$ positive? Where is it negative?

(b) Where (for which values of $t$) is $F'$ positive? Where is it negative?

(c) Which of the following could be a formula for $F'$? Please *circle the correct answer*, and explain. (You don't need to know anything about computing derivatives. Just think about your answers above.)

$$F' = 2 \qquad F' = 2t - 12 \qquad F' = t \qquad F' = t^2$$

7. Let $f(x) = 3x^2 + 1$.

(a) Using your calculator, find the average rate of change $\Delta y/\Delta x$ of $f(x)$ with respect to $x$, from $x = 1$ to $x = 1 + \Delta x$, for each of the following three values of $\Delta x$: $\Delta x = 0.1$, $\Delta x = 0.01$, $\Delta x = 0.001$.

(b) Using only part (a) of this problem, what do you think $f'(1)$ is? Please explain.

(c) Use *algebra* to show that the average rate of change of $f(x)$ with respect to $x$, from $x = 1$ to $x = 1 + \Delta x$, is $6 + 3\Delta x$.

(d) Find $f'(1)$.

(e) Find the equation of the line shown below.

$f(x) = 3x^2 + 1$ (solid), and its tangent line at $x = 1$ (dashed)