These are alleged answers. For each error herein, you get extra-credit points for being the first to report it by e-mail.

1 Recall that

\[ NQ = \frac{f(x + h) - f(x)}{h}. \]

We spend a bit of time on \( f(x + h) \): we write the function definition in a fill-in-the-blanks form:

\[ f(\quad) = 1 - 3(\quad)^2, \]

and then write in the \( x + h \) in every blank (note that \( (x + h)^2 = x^2 + 2hx + h^2 \)):

\[
\begin{align*}
\text{f}(x + h) & = 1 - 3(x + h)^2 \\
& = 1 - 3(x^2 + 2hx + h^2) \\
& = 1 - 3x^2 - 6hx - 3h^2
\end{align*}
\]

Next we work a little bit on the numerator of \( NQ \):

\[
\begin{align*}
\text{f}(x + h) - f(x) & = \left(1 - 3x^2 - 6hx - 3h^2\right) - \left(1 - 3x^2\right) \\
& = 1 - 3x^2 - 6hx - 3h^2 - 1 + 3x^2 \\
& = -6hx - 3h^2 = h(-6x - 3h)
\end{align*}
\]

This means that

\[ NQ = \frac{f(x + h) - f(x)}{h} = \frac{h(-6x - 3h)}{h} = -6x - 3h. \]

2 (a) \( (f \circ g)(x) = 1 - 3(g(x))^2 = 1 - 3(7 - 4x)^2 = 1 - 3(49 - 56x + 16x^2) \)

So that \( (f \circ g)(x) = -48x^2 + 168x - 146. \)

(b) \( (g \circ f)(x) = 12x^2 + 3 \)
The graph shows that this parabola has an equation of form

\[ f(x) = A(x - 3)^2 + 8. \]

We can use Descarté’s idea to make the \((7, 0)\) point tell us the value of the coefficient \(A\): the coordinates of \((7, 0)\) must satisfy the equation:

\[ 0 = f(7) = A(7 - 3)^2 + 8; \quad \text{or} \quad 0 = A(4)^2 + 8; \quad \text{or} \quad 0 = 16A + 8; \]

so \(A = -1/2\), and the equation becomes

\[ f(x) = -\frac{1}{2}(x - 3)^2 + 8. \]

The \(y\)-coordinate of the \(y\)-intercept is given by \(f(0) = \frac{7}{2}\).