Differentiation Quiz … Set 1

Multiple Choice
Circle the choice that best completes the statement or answers the question.

1. Determine $f'(2)$ for $f(x) = x^2 + 4x - 1$. _____
   a. 7
   b. 8
   c. 11
   d. 12

2. All but one of the functions is differentiable for all real values of x.
   Which function is not differentiable for at least one real value of x? _____
   a. $f(x) = x^2 + 1$
   b. $g(x) = \dfrac{1}{x^2 + 1}$
   c. $h(x) = |x|$
   d. $j(x) = x^3 - 3x$

3. Determine the derivative $\dfrac{dy}{dx}$ for $y = 2x^3 - 3x + 1$. _____
   a. $6x^2 - 3$
   b. $6x^2 - 3x$
   c. $3x^2 - 3$
   d. $x^2 - 3$

4. Determine $\dfrac{dy}{dx}$ for $y = \dfrac{x^2 - 4}{x^2 + 4}$ when $x = 1$. _____
   a. $-\dfrac{16}{25}$
   b. $\dfrac{4}{25}$
   c. $\dfrac{16}{25}$
   d. 1

5. The position s, in metres, of an object moving in a straight line is given by $s(t) = 5t(t - 2)^2$,
   where t is the time in seconds. Determine the velocity of the object at time $t = 1$. _____
   a. 15 m/s
   b. 5 m/s
   c. 0 m/s
   d. −5 m/s

6. An initial population, p, of 1500 bacteria grows in number according to the equation

$$p(t) = 1500\left(1 + \frac{5t}{t^2 + 30}\right),$$

   where t is in hours. Determine the rate at which the population is growing after 3 h. _____
   a. 0.069 bacteria/h
   b. 104 bacteria/h
   c. 281 bacteria/h
   d. 4038 bacteria/h

7. For which value(s) of x is the tangent to $f(x) = \dfrac{x^2 + 3}{x + 1}$ horizontal? _____
   a. $x = 1$
   b. $x = -3, 1$
   c. $x = -1, 3$
   d. $x = 3$

8. Determine the value of k for which $f'(3) = 2$, if $f(x) = \dfrac{x + k}{x - 1}$. _____
   a. −9
   b. −5
   c. 5
   d. 9

9. If $f(x) = \sqrt{x^2 - 1}$ and $g(x) = x + 1$, which expression is equal to $f(g(x))$? _____

   a. $1 + \sqrt{x^2 - 1}$
                         c. $(x + 1)^2 - 1$

   b. $\sqrt{x^2 + 2x}$
                         d. $\sqrt{x^2 + x - 1}$

10. Determine the slope of the tangent to the curve $y = (2x - 3x^2)^2$ at $(1, 1)$. _____

   a. -16
                         c. -2

   b. -8
                         d. 8