Differentiation – Fractions and Indices (AI)

1. The derivative will give you the value of the _____ of the tangent to the curve for any value of ____.

2. Differentiate each of the following. Be careful to use proper notation.

a) $f(x) = x^3 + 2x^2 - x + 2$

b) $y = \frac{3}{2}x^2 + x - \frac{3}{4}x^4$

c) $f(x) = \frac{3}{x^2} + \frac{-1}{x} + \frac{x}{4}$

Recall that:

$$x^{-2} = \frac{1}{x^2}$$

Use this rule for c), d), e) and f).

Remember to REWRITE the function BEFORE differentiating!

d) $y = 4 - \frac{1}{x} + \frac{3}{x^2} - 4x$

e) $f(x) = x - \frac{2}{x^3} - \frac{3}{x^2}$

f) $y = \frac{3}{4t^2} - \frac{2}{3t^2}$

3. Briefly explain what $f'(4) = 20$ means.

4. A function, $y = 2x^3 - x$, has a tangent at $x = -3$. Work out the gradient of the tangent.

5. At x, the tangent to a function, $f(x) = \frac{x^3}{3} - 2x^2 - 8$ has a gradient of 5. Find the possible values of x.

6. If the gradient of a tangent is _____ then the function, $f(x)$ is increasing.

7. If the gradient of a tangent is _____ then the function, $f(x)$ is decreasing.

8. At a _____ or a _____ the gradient has a value of 0. For extra practice, find the x-coordinates for the maximum and minimum in Q5.