Calculus Lesson 1: Gradient

1. Find from the first principles the gradient functions of each of the following functions:
   1. *f(x)* = x3
   2. *f(x)* = 3x2
   3. *f(x)* = x2 + 2x
   4. *f(x)* = x2 – 2
   5. *f(x)* = 3x – 3
   6. *f(x)* = 2x2 – x + 1
2. Find the gradient of function (a) When x = 2
3. Find the gradient of function (f) when x = -1
4. Copy and complete the table by entering your gradient functions above.

|  |  |
| --- | --- |
| *Function f(x)* | *Gradient function* |
| x2 | 2x |
| 2x2 | 4x |
| *½* x2 | x |
| x2 + x | 2x + 1 |
| x3 |  |
| 3x2 |  |
| x2 + 2x |  |
| x2 – 2 |  |
| 3x – 3 |  |
| 2x2 – x + 1 |  |

1. Describe any patterns you notice in your table for question 4, between a function and its gradient function. Try writing a formula for this relationship (don’t cheat! See what you can figure out on your own)

Calculus Lesson 2: Differentiation

1. Differentiate each of the following expressions with respect to x.
   1. 5x3 b. 7x2 c. 4x6 d. X2

e. X2 f. X6 g. 5 h. 6x

1. Differentiate each of the following expressions with respect to x.
   1. 3x2 + 4x b. 5x3 – 2x2 c. 10x3 – d. X3 – 3x2 + x

e. 12x4 – 2x2 + 5 f. + x – 4 g. –3x4 + 3x4 – x + 1 h.

1. Differentiate each of the following expressions with respect to x.