Basic Differentiation

Introductory Mathematics (Curtin University)

WORKSHEET

Basic differentiation

1 Find the derivative of the following.

a $3x^2 - 5x + 4$

b $12x^3 + 7x^2 - 3x - 2$

c $5 + 8x - 6x^2 - 9x^3$

d $3x + 2 - 7x^3 + x^2$

e $2x^{11} + 5x^7 - 8x^9 + x$

f $-10x - 6x^3 + 15x^2$

g $x + 8x^0 - 9x^4 - 3x^7$

2 Find the gradient function of the following.

a $y = 2x - 7$

b $y = 10 - 3x$

c $y = x^2 + 7x - 30$

d $y = -4x^2 + 9x - 6$

e $f(x) = x^3 - 3x^2 + 3x - 1$

f $g(x) = 5x^4 - 7x^2 + 10$

g $p(q) = 9 - 2q + 4q^2 - q^3$

h $m(z) = 6z - 11z^8 + 9z^3$

i $x(t) = 7t^2 + t^5 - 10t$

j $h(k) = k - 4 + 2k^3 - 3k^2$

3 Find the instantaneous rate of change of the following functions at the specified point.

a x^2 at $x = 3$

b $-x^2$ at $x = 3$

c $3x - 8$ at $x = 2$

d $x^2 - 7x + 2$ at $x = 1$

e $6x^2 + 10x - 12$ at $x = -2$ **f** $x^3 + 3x^2 - 4x - 7$ at $x = -1$

g $x^4 + 9x^3 - 4x^2 - 2x + 6$ at $x = 2$ **i** $t^3 + 12t^2 - 3t - 1$ at $t = -2$

h $x^2 - 2 + 6x^3 - 11x$ at $x = -3$ **j** $9d - 2d^2 + 7d^3$ at $d = -4$

4 Given $f(x) = x^3 + 12x^2 - 5x + 1$, find:

a $f(2)$

b $f(-1)$

c $f'(x)$

d $f'(0)$

e $f'(3)$

f $f'(-2)$

g $f'(-3)$

5 Given $f(x) = x^6 - 7x^3 + 12x - 18$, complete the table.

x	$f(x)$	$f'(x)$
-3		
-2		
-1		
0		
1		
2		
3		

Answers

1 **a** $6x - 5$

b $36x^2 + 14x - 3$

c $8 - 12x - 27x^2$

d $3 - 21x^2 + 2x$

e $22x^{10} + 35x^6 - 72x^8 + 1$

f $-10 - 18x^2 + 30x$

g $1 - 36x^3 - 21x^6$

2 **a** $\frac{dy}{dx} = 2$

b $\frac{dy}{dx} = -3$

c $\frac{dy}{dx} = 2x + 7$

d $\frac{dy}{dx} = -8x + 9$

e $f'(x) = 3x^2 - 6x + 3$

f $g'(x) = 20x^3 - 14x$

g $p'(q) = -2 + 8q - 3q^2$

h $m'(z) = 6 - 88z^7 + 27z^2$

i $x'(t) = 14t + 5t^4 - 10$

j $h'(k) = 1 + 6k^2 - 6k$

3 **a** 6

b -6

c 3

d -5

e -14

f -7

g 122

h 145

i -39

j 361

4 **a** 47

b 17

c $3x^2 + 24x - 5$

d -5

e 94

f -41

g -50

5

x	$f(x)$	$f'(x)$
-3	864	-1635
-2	78	-264
-1	-22	-15
0	-18	12
1	-12	-3
2	14	120
3	558	1281