CARLINGFORD HIGH SCHOOL

DEPARTMENT OF MATHEMATICS

Year 12

Extension 1 Mathematics

Assessment Task 2

2019

Time allowed: 60 minutes

Student Number: _____

Instructions:

- All questions should be attempted on your own paper.
- Show ALL necessary working.
- Marks may not be awarded for careless or badly arranged work.
- Only board-approved calculators may be used.
- Please write on one side of each sheet of paper only.

	Q.1	Q.2	Q.3	Q.4	Q.5	Q.6	TOTAL
Differential Calculus		/5		/8	/5		/18
Integral Calculus	/4	/2	/3			/5	/14
	/4	/7	/3	/8	/5	/5	/32

Q.1
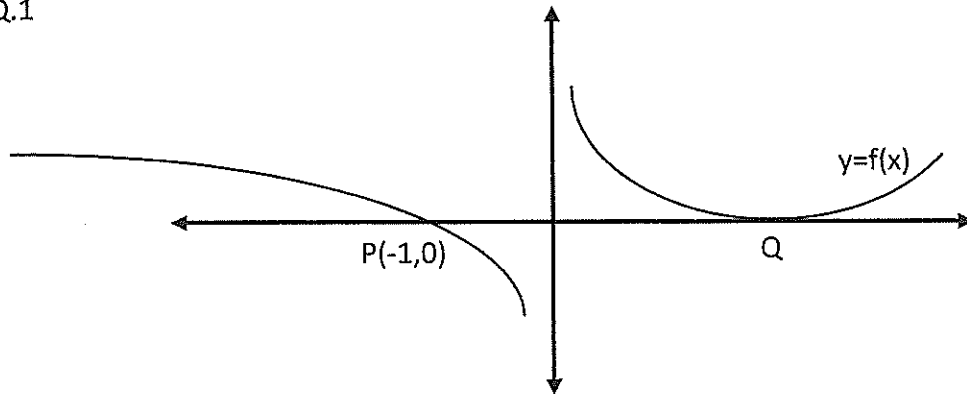
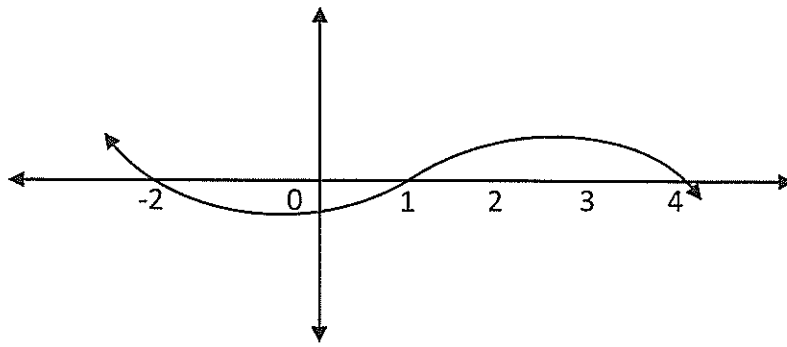The figure above shows a curve with equation $y = f(x)$.

The curve cuts the x axis at the point $P(-1,0)$ and touches it at $Q(a, 0)$.

Its gradient function is given by $f'(x) = \dfrac{8x^3 - 1}{x^2}, x \neq 0.$

(i)   Find an equation of the tangent to the curve at P.

(ii)   Find the equation of the curve.

(iii) Find the x coordinate a, of Q.

[1+2+1=4]

Q.2   The diagram shows the curve with equation $y = (4 - x)(x + 2)(x - 1)$

A tangent is drawn to the curve at the point $x = 2$.

(i)   Find the equation of this tangent at $x = 2$.

(ii)   Hence find the other point of intersection between the tangent and the curve.

(iii) Find the area enclosed between the tangent to the curve at $x = 2$ and the curve.

[2+3+2=7]

Q.3   Find the area bounded by the curve $y = \dfrac{24}{x^2}$, the lines $x = 6$ and $y = 6$ and the co-ordinate axes. (Hint: Draw the graph before you start)

[3]

Q.4 A curve has equation $f(x) = \dfrac{x^2}{(x+2)(x-3)}$

(i) State the equations of all vertical asymptotes.

(ii) Show clearly that $y = 1$ is a horizontal asymptote to the curve.

(iii) Find any turning points of the curve, clearly stating their coordinates and showing their nature. (**do not** attempt to find the second derivative).

(iv) Clearly describe the behaviour of the curve as it approaches each of its asymptotes.

(v) Sketch the curve, showing all relevant details.

(vi) The straight line $y = k$, where k is a constant, cuts the curve at two points. Find all possible values of k.

[1+1+2+2+1+1=8]

Q.5 Ship A is sailing due East at a speed of 15 km/h and ship B is sailing due north at a speed of 20 km/h.

At noon, B is 100 km due South of A.

After t hours, the distance between A and B is s kilometres.

(i) Express s in terms of t.

(ii) Find $\dfrac{ds}{dt}$.
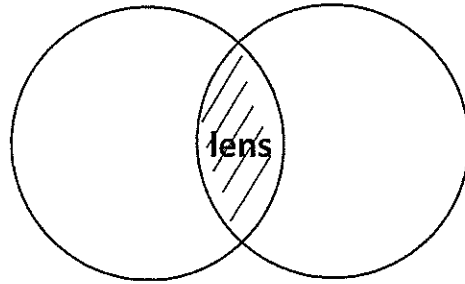
(iii) At what time are A and B closest?

[2+1+2=5]

Q.6 A double convex lens is in the shape of the intersection of two equal spheres.

If the diameter of the lens is 3cm and the thickness is 1cm,

Find:

(i) The radius of the two equal spheres

(ii) The volume of the lens

[[2+3=5]

END OF PAPER