Solomon Practice Paper

Pure Mathematics 3F

Time allowed: 90 **minutes**

Centre: www.CasperYC.club

Name:

Teacher:

Question	Points	Score
1	7	
2	8	
3	9	
4	10	
5	11	
6	13	
7	17	
Total:	75	

How I can achieve better:

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1.

$$\mathrm{f}(x) \equiv 2x^2 + 7x - 3.$$

Given that when $\mathrm{f}(x)$ is divided by $(2x - k)$ the remainder is -8,

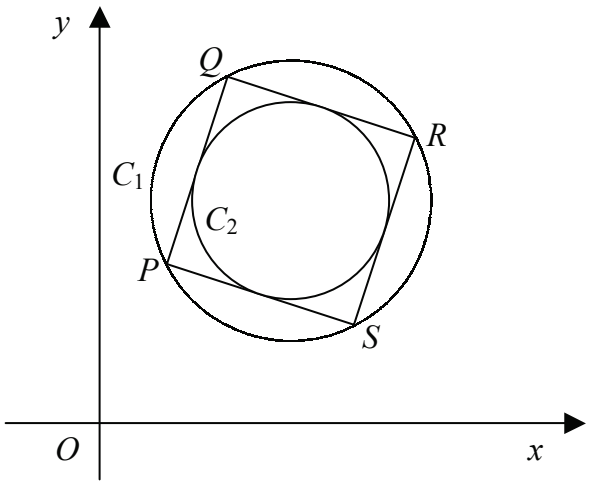
(a) find the two possible values of k. [4]

Given also that when $\mathrm{f}(x)$ is divided by $(x - 3k)$ the remainder is 27,

(b) find k. [3]

Total: 7

2. Figure shows a square PQRS.



The corners of the square have the following coordinates:

$$P(2, 5), \quad Q(4, 11), \quad R(10, 9), \quad S(8, 3).$$

The circle C_1 circumscribes the square.

(a) Find the coordinates of the centre of circle C_1. [2]

(b) Find the radius of circle C_1. [2]

The circle C_2 is inscribed in the square.

(c) Find an equation of circle C_2. [4]

Total: 8

3. With respect to a fixed origin, O, the points A and B have position vectors $(\mathbf{i} - 5\mathbf{j} - 4\mathbf{k})$ and $(3\mathbf{i} + 5\mathbf{j} - 2\mathbf{k})$ respectively.

(a) Write down vector $\overrightarrow{AB}$. [2]

The point C has position vector $(9\mathbf{i} - 7\mathbf{j} - 2\mathbf{k})$.

(b) Show that $\overrightarrow{AC}$ is perpendicular to $\overrightarrow{AB}$. [3]

(c) Find the area of triangle ABC in the form $k\sqrt{6}$. [4]

Total: 9

4. (a) Given that $|x| < \frac{1}{2}$, expand $(1-2x)^{\frac{1}{2}}$ as a series in ascending powers of x, as far as the term in x^3. [3]

(b) Show that when $x = 0.01$, [3]

$$(1-2x)^{\frac{1}{2}} = \frac{7}{10}\sqrt{2}.$$

(c) Hence, use your series to find the value of $\sqrt{2}$ correct to 6 decimal places. [4]

Total: 10

5. (a) Show that [4]

$$\int_0^{\frac{\pi}{4}} (1-\sin(4x))\,\mathrm{d}x = \frac{1}{4}(\pi - 2).$$

(b) Use integration by parts to find [7]

$$\int x^2 \mathrm{e}^{\frac{1}{2}x}\,\mathrm{d}x.$$

Total: 11

6. (a) i. Differentiate 3^{2x} with respect to x. [7]

ii. Find the coordinates of the stationary point on the curve

$$y = 3^{2x} - 18(3^x).$$

(b) A curve is given by [6]

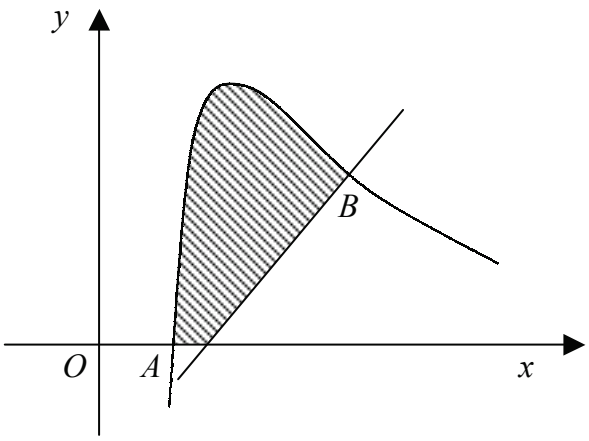
$$(x+2y)^2 - 3x^2 = 4.$$

Find the gradient of the curve at the point $(2, -3)$.

Total: 13

7. Figure shows part of the curve with parametric equations

$$x = \frac{3}{t}, \quad \text{and} \quad y = 4t - t^2, \quad t \neq 0.$$



(a) Find the value of the parameter t at the point A where the curve meets the x-axis. [2]

The point B on the curve has parameter $t = 1$.

(b) Find an equation of the normal to the curve at the point B. [6]

(c) Show that the area of the shaded region enclosed by the curve, the x-axis and the normal to the curve at B is $12(2\ln(2) - 1)$. [9]

Total: 17