

Leaving Cert Ordinary Level 2000 Paper 1 Solutions

The marking scheme shown is not the official marking scheme
it is only the opinion of the author!

Question 1

(a) $2/5$ (10)

(b) (i) $\frac{100}{.787564} = \text{Euro}126.97\dots$ (ii) $126.97 \times 1.95683 = \text{DM} 248.34$ (20)

© (1) $\text{£}12400 \times .24 = \text{£}2976$

Total Tax = $\text{£}5138$, $\text{£}2976$ is the tax on $\text{£}12400$ therefore the rest of the Tax

= $\text{£}5138 - \text{£}2976 = \text{£} 2162$ which is 46% of his taxable income over $\text{£}12400$. So the taxable income above $\text{£}12400$ is

$\frac{\text{£}2162}{46} \times 100 = \text{£}4700$ therefore the total income is (20)

$\text{£}\text{£}7400 + \text{£}12400 + \text{£}4700 = \text{£}24500$

At last a question on the Euro, part a very easy.

Question 2

(a) $5(5/2) - 3(2/3) = 10.5$ (10)

(b) $(\frac{-1}{2}, \frac{-1}{2}), \dots, (\frac{1}{4}, \frac{-1}{4})$ (20)

(i) $243 = 3^5$.. (ii) $\sqrt{27} = (3^3)^{1/2} = 3^{3/2}$ (iii) $\sqrt{33^x} = \left(\frac{243}{\sqrt{27}}\right)^2 \Rightarrow 3^{x+1/2} = \left(\frac{3^5}{3^{3/2}}\right)^2$ (20)

$$\Rightarrow 3^{x+1/2} = \frac{3^{10}}{3^3} \Rightarrow 3^{x+1/2} = 3^7 \Rightarrow x = \frac{13}{2}$$

Nice question similar to previous years.

Question 3

(a) $tp - k = 7k, p = 8k/t$ (10)

$$f(2) = 3(2)^3 + 8(2)^2 - 33(2) + 10 = 0 \Rightarrow 24 + 32 - 66 + 10 = 0 \Rightarrow 2 \text{ is a root}$$

2[3...8...-33)...10.....synthetic.division

(b)6.....28....-10

.....14.....-5.....0.....Solve... $3x^2 + 14x - 5 = 0 \Rightarrow x = 1/3, x = -5$

(20)

$$f(x) = ax^2 + bx - 8 \Rightarrow f(1) = a + b - 8 = 9 \Rightarrow a + b = 17$$

© $f(-1) = a - b - 8 = 3 \Rightarrow a - b = 11$

$$a + b = 17$$

$$a - b = 11 \Rightarrow 2a = 28 \Rightarrow a = 14, b = 3$$

Sub these values for a and b into the last bit to get

$$14x^2 + 3x = 3x^2 + 14x \Rightarrow 11x^2 - 11x = 0 \Rightarrow x = 0, x = 1$$

This question was far too long no need for c (ii). (20)

Question 4

(a) $5 + 18i$ (10)

$$w + 3 - i \Rightarrow w + 6i = 3 + 5i, |w + 6i| = \sqrt{34}$$

(b) $\frac{1}{w + 6i} = \frac{1}{3 + 5i} = \frac{1}{3 + 5i} \times \frac{3 - 5i}{3 - 5i} = \frac{3 - 5i}{34}$ (20)

$$z = 2 + 4i \Rightarrow z^2 + 28 = (2 + 4i)^2 + 28 = 4 + 16i - 16 + 28 = 16 + 16i$$

© $k(z + 28) = |z|(1 + i) \Rightarrow 16k + 16ki = \sqrt{20}(1 + i) \Rightarrow 16k = \sqrt{20} \Rightarrow k = \frac{\sqrt{20}}{16} \Rightarrow k = \frac{\sqrt{5}}{8}$

(20)

One of the nicer Complex number questions, although some students will have found the notation difficult to understand.

Question 5

(a) $T_n = n^2 + 1 \Rightarrow T_1 = 2, T_2 = 5, T_3 = 10, T_4 = 17 = T_1 + T_2 + T_3$ (10/15)

(b) Given $T_1 = 1, r = \frac{11}{10} \Rightarrow T_2 = \frac{11}{10}, T_3 = \left(\frac{11}{10}\right)^2, T_4 = \left(\frac{11}{10}\right)^3 \Rightarrow$ (20)

$$S_4 = 1 + \frac{11}{10} + \frac{121}{100} + \frac{1331}{1000} = 3.662$$

$$T_n = 5n, \dots S_n = \frac{n}{2}\{10 + (n-1)5\} = \frac{n}{2}\{5n + 5\} \quad (15/20)$$

$$S_{199} = \frac{199}{2}\{5(199) + 5\} = 99500$$

Somebody wants you to use your calculator!

Question 6

(a) Book work must use h or ΔX (10)

(b) Period 8 range is 0 – 10

(10marks)

x	2	8	14	20	26
F(x)	10	0	5	0	10

(10)

We know the slope of the Tangent is 10 therefore $dy/dx = 10$

©

$$g(x) = (2x+3)(x^2-1) \Rightarrow \frac{dy}{dx} = (2x+3)(2x) + (x^2-1)2 = 10 \dots (\text{Simplify}) \Rightarrow 6x^2 + 6x - 12 = 0 \Rightarrow$$

$$(x-1)(x+2) = 0 \Rightarrow x = 1, x = -2, \text{sub.in.to..find..y}$$

$$x = 1, \Rightarrow y = 0, ; x = -2, \Rightarrow y = -3 \therefore \text{tan gents. are : } y = 10(x-1) \dots y + 3 = 10(x+2)$$

(20)

A bit different from previous years ,last part a dead loss for weak students.

Question 7

(a) (i) $8x$ (ii) $9 - 3x^2$ (10)

$$(b) (i) \frac{dy}{dx} = \frac{(x-1)(2) - (2x-7)(1)}{(x-1)^2} \quad (ii) \frac{dy}{dx} = 3(x^2 + 5x - 1)^2(2x + 5) \quad (20)$$

$$s = 30t - \frac{9}{4}t^2 \quad (i) \frac{ds}{dt} = 30 - \frac{9}{2}t @ t = 2 : \frac{ds}{dt} = 2$$

© (20)

$$\frac{ds}{dt} = 0 \Rightarrow 30 - \frac{9}{2}t = 0 \Rightarrow t = \frac{60}{9} : @ t = \frac{60}{9} \Rightarrow s = 30\left(\frac{60}{9}\right) - \frac{9}{4}\left(\frac{60}{9}\right)^2 = 100$$

Lovely question! notice again it's wall-to-wall fractions; they really do want you to use the fraction key!

Question 8

(a) $p(x) = 3x - 12$, $p(x) < 0 \Rightarrow 3x - 12 < 0 \Rightarrow x < 4 \Rightarrow x = 0, 1, 2, 3$ (10)

b (i)

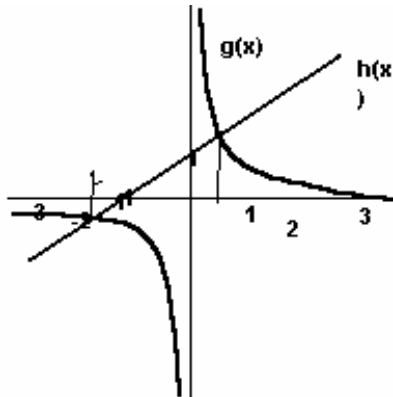
x	-3	-2	-1	1	2	3
$g(x) = 1/x$	-1/3	-1/2	-1	1	1/2	1/3

(10)

b (ii)

x	-3	-2	-1	0	1	2	3
$h(x) = x + 1$	-2	-1	0	1	2	3	4

(10)



b (iii) $g(x) = h(x)$ where the graphs intersect this occurs at the points $x = -1.6$ and $x = 0.6$ (about)

©

if $f(x)$ has a turning point at $x = -1$ then $f'(x) = 0$ at $x = -1$
this we will use to find a.

$$f(x) = x^3 - 3x^2 + ax + 1 \Rightarrow f'(x) = 3x^2 - 6x + a = 0 @ x = -1 \Rightarrow 3 + 6 + a = 0 \Rightarrow a = -9$$

$$f(x) = x^3 - 3x^2 - 9x + 1. (ii) f''(x) = 6x - 6 @ x = -1 f''(-1) = -12 \Rightarrow \text{max} @ x = -1.$$

$$(iii) \text{Solve : } 3x^2 - 6x - 9 = 0 \Rightarrow x^2 - 2x - 3 = 0 \Rightarrow (x-3)(x+1) = 0 \Rightarrow x = 3, x = -1$$

$$\text{Min} @ x = 3, y = -26$$

(20)

This question had far too many bits it looks like they intended asking a question on a max and min and just had to fit it in somewhere!