Push The Pace #2

You have thirty-five minutes to answer seven examination questions

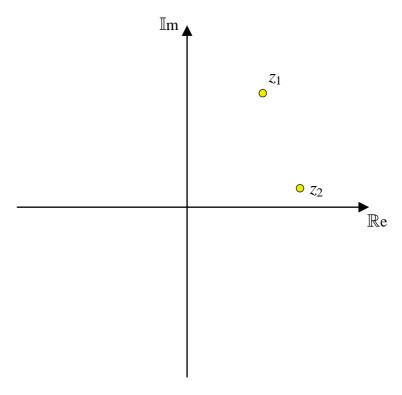
Marks Available: 40 (+ 6 bonus)

Further A-Level Pure Mathematics Push The Pace Revision Papers

Question 1

Further AS-Level Examination Question from October 2020, Paper 1, Q2 (OCR)

The Argand diagram shows two complex numbers z_1 and z_2



- (a) Mark points representing each of the following complex numbers,
 - z₁*
 - $\bullet \qquad z_2 z_1$

[2 marks]

(**b**) In the case where $z_1 = 1 + 2i$ and $z_2 = 3 + i$, find $\frac{z_2 - z_1}{z_1^*}$ in the form a + bi, where a and b are real numbers.

Question 2 Further A-Level Examination Question from June 2022, Paper 4, Q1 (WJEC)		
A function f has domain $(-\infty, \infty)$ and is defined by $f(x) = \cosh^3 x - 3 \cosh x$		
(a)	Show that the graph of $y = f(x)$ has only one stationary point.	
		[4 marks]
(b)	Find the nature of this stationary point.	
		[3 marks]

[1 mark]

(c)

State the largest possible range of f(x)

Question 3

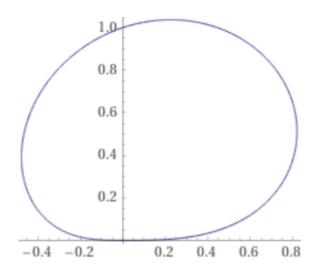
Further A-Level Examination Question from June 2019, Paper 2, Q2 (WJEC) When plotted on an Argand diagram, the four fourth roots of the complex number $9 - 3\sqrt{3}$ i lie on a circle. Find the equation of this circle.

[4 marks]

Question 4

Further A-Level Examination Question from June 2019, Paper 2, Q9 (OCR)

The diagram shows the curve $r = \sqrt{\sin \theta} e^{\frac{1}{3}\cos \theta}$ for $0 \le \theta \le \pi$



(a) Find the exact area enclosed by the curve.

(**b**) Show that the greatest value of r on the curve is $\sqrt{\frac{\sqrt{3}}{2}} e^{\frac{1}{6}}$

Question 5

Further A-Level Examination Question from June 2019, Paper 2, Q10 (OCR)

(a) Use differentiation to find the first two non-zero terms of the Maclaurin expansion of $ln\left(\frac{1}{2} + cos x\right)$

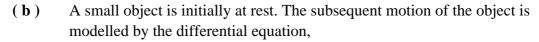
[4 marks]

(**b**) By considering the root of the equation
$$ln\left(\frac{1}{2} + cos x\right) = 0$$
 deduce that $\pi \approx 3\sqrt{3 ln\left(\frac{3}{2}\right)}$

Question 6

Further A-Level Examination Question from June 2020, Paper 2, Q12 (AQA)

(a) Given that $I = \int_a^b e^{2t} \sin t \, dt$, show that $I = \left[q e^{2t} \sin t + r e^{2t} \cos t \right]_a^b$ where q and r are rational numbers to be found.



$$\frac{dv}{dt} + v = 5 e^t \sin t$$

where v is the velocity at time t

Find the speed of the object when $t = 2\pi$, giving your answer in exact form.

[6 BONUS marks]