α	β	γ	δ	ε	ζ	η	θ	ι	κ	λ	μ	ν	ξ	o	π	ρ	σ	τ	υ	φ	χ	ψ	ω

"Complacency lives on the driveway of disappointment and failure"

Further Maths A2 (M2FP2D1) Assignment β (beta) A

Due w/b 25th September

DRILL *Drills are the very basic techniques you need to solve maths problems. You need to practise these until you can do them quickly and accurately. Answers are not provided for drill questions.*

A Write the following complex numbers in mod-arg form and plot them on an argand diagram

1. $z = 2 + 2i$
2. $z = 1 - \sqrt{3}i$
3. $z = -2 - 5i$
4. $z = \frac{3}{1+i\sqrt{3}}$
5. $z = \frac{1}{2-i}$
6. $z = \frac{1+i}{1-i}$

B Find the square roots of the following complex numbers

1. $7 + 24i$
2. $11 + 60i$
3. $5 - 12i$

PREPARATION *Every week you will be required to do some preparation for future lessons, to be advised by your teacher.*

CURRENT WORK AND CONSOLIDATION

1. For the differential equation $\frac{\mathrm{d}^2y}{\mathrm{d}x^2} + 3\frac{\mathrm{d}y}{\mathrm{d}x} + 2y = 2x(x+3)$, find the solution for which at $x = 0$, $\frac{\mathrm{d}y}{\mathrm{d}x} = 1$ and $y = 1$.

2. Solve the differential equation $\frac{\mathrm{d}y}{\mathrm{d}x} - 3y = x$ to obtain y as a function of x.

3. a) Simplify the expression $\frac{(x+3)(x+9)}{x-1} - (3x-5)$, giving your answer in the form $\frac{a(x+b)(x+c)}{x-1}$, where a, b and c are integers.

   b) Hence, or otherwise, solve the inequality $\frac{(x+3)(x+9)}{x-1} > 3x-5$.

4. a) Express $\frac{5r+4}{r(r+1)(r+2)}$ in partial fractions.

b) Hence, or otherwise, show that $\sum_{r=1}^{n} \frac{5r+4}{r(r+1)(r+2)} = \frac{7n^2+11n}{2(n+1)(n+2)}$.

5. a) Find, in the simplest surd form where appropriate, the exact values of x for which $\frac{x}{2}+3=\left|\frac{4}{x}\right|$.

b) Sketch, on the same axes, the line with equation $y=\frac{x}{2}+3$ and the graph of $y=\left|\frac{4}{x}\right|, x \neq 0$.

c) Find the set of values of x for which $\frac{x}{2}+3>\left|\frac{4}{x}\right|$.

6. a) Express $\frac{2}{(r+1)(r+3)}$ in partial fractions.

b) Hence prove, by the method of differences, that $\sum_{r=1}^{n} \frac{2}{(r+1)(r+3)} = \frac{n(an+b)}{6(n+2)(n+3)}$, where a and b are constants to be found.

c) Find the value of $\sum_{r=21}^{30} \frac{2}{(r+1)(r+3)}$, to 5 decimal places.

7. a) Find the general solution of the differential equation $3\frac{\mathrm{d}^2y}{\mathrm{d}x^2}-\frac{\mathrm{d}y}{\mathrm{d}x}-2y=x^2$.

b) Find the particular solution for which, at $x=0, y=2$ and $\frac{\mathrm{d}y}{\mathrm{d}x}=3$.

8. a) Find, in terms of k, the general solution of the differential equation $\frac{\mathrm{d}^2x}{\mathrm{d}t^2}+4\frac{\mathrm{d}x}{\mathrm{d}t}+3x=kt+5$, where k is a constant and $t > 0$.

For large values of t, this general solution may be approximated by a linear function.

b) Given that $k = 6$, find the equation of this linear function.

9. If $(x^2+1)\frac{dy}{dx}+4xy=12x^3$ and $y = 1$ when $x = 1$, express y in terms of x in as simple a form as possible.

10. Show the following where p and q are integers to be found

$$\int_{1.5}^{2} \frac{2x+2}{(1-x)(1-2x)} = p\ln 2 + q\ln 3$$

11. Use $t = \sqrt{x}$ to show the following, where p and q are functions of x and A is a constant to be found

$$\int \frac{1}{\sqrt{x}(x-4)}dx = A\ln\frac{p(x)}{q(x)} + C$$

12. Find the exact answer of the following

$$\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{1-\cos 2x}{1+\cos 2x}dx$$

13. $$\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = \sin x$$

14. $$\frac{d^2y}{dx^2} + \frac{dy}{dx} + y = 1 + x$$

15. $$\frac{d^2y}{dx^2} - 4y = 3e^{-2x}$$

16. $$4\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + y = \cos x - \sin x$$

17. $$9\frac{d^2y}{dx^2} + 6\frac{dy}{dx} + y = x^2 + 2x + 3$$

18. $$\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 3y = 65\sin 2x$$

Answers

Drill

A

1. $2\sqrt{2}\left(\cos\frac{\pi}{4} + i\sin\frac{\pi}{4}\right)$
2. $2\left(\cos-\frac{\pi}{3} + i\sin-\frac{\pi}{3}\right)$
3. $\sqrt{29}(\cos-1.95 + i\sin-1.95)$
4. $\frac{3}{2}\left(\cos-\frac{\pi}{3} + i\sin-\frac{\pi}{3}\right)$
5. $\frac{\sqrt{5}}{5}(\cos 0.46 + i\sin 0.46)$
6. $\cos\frac{\pi}{2} + i\sin\frac{\pi}{2}$

B

1. $\pm(4+3i)$
2. $\pm(6+5i)$
3. $\pm(3-2i)$

Current work and practice

1) $y = 5e^{-x} - 3e^{-2x} + x^2 - 1$
2) $y = -\frac{x}{3} - \frac{1}{9} + Ce^{3x}$
3) a) $\frac{-2(x-11)(x+1)}{x-1}$
   b) $x < -1, 1 < x < 11$
4) $\frac{2}{r} + \frac{1}{r+1} - \frac{3}{r+2}$
5) a) $-4, -2, -3 + \sqrt{17}$
   b) graph
   c) $4 < x < 2, x > -3 + \sqrt{17}$
6) a) $\frac{1}{r+1} - \frac{1}{r+3}$
   b) 0.02738
7) a) $y = -\frac{1}{2}x^2 + \frac{1}{2}x - \frac{7}{4} + Ae^{-\frac{2}{3}x} + Be^x$
   b) $y = -\frac{1}{2}x^2 + \frac{1}{2}x - \frac{7}{4} + \frac{3}{4}e^{-\frac{2}{3}x} + 3e^x$
8) a) $x = Ae^{-t} + Be^{-3t} + \frac{k}{3}t + \frac{15-4k}{9}$
   b) $x = 2t - 1$
9) $y = 2x^2 - 1$
10) $p = 7, q = -3$
11) $\frac{1}{2}\ln\frac{\sqrt{x}-2}{\sqrt{x}-2} + C$
12) $\frac{1}{6}(4\sqrt{3} - \pi)$
13) $y = Ae^{-x} + Be^{-2x} + \frac{1}{10}(\sin x - 3\cos x$
14) $y = Ae^{-\frac{x}{2}}\left(\cos\frac{\sqrt{3}x}{2} + \sin\frac{\sqrt{3}x}{2}\right)$
15) $y = Ae^{2x} + \left(B - \frac{3}{4}x\right)e^{-2x}$
16) $y = Ae^{\frac{x}{4}} + Be^x - \frac{1}{17}(4\cos x + \sin x)$
17) $y = e^{-\frac{x}{3}}(A + Bx) + x^2 - 10x + 45$
18) $y = Ae^x + Be^{2x} + 8\cos 2x - \sin 2x$

BHASVIC MATHS

ASSIGNMENT beta COVER SHEET

Name _____ Maths Teacher _____

Question	Done	Backpack	Ready for test	Notes
Drill A				
Drill B				
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				