

Year 12 Specialist TEST 2 2018

TIME: 5 mins reading 40 minutes working Classpads **allowed!** 36 marks 8 Questions

Name:		
Teacher:		

Note: All part questions worth more than 2 marks require working to obtain full marks.

Q1 (2 & 2 = 4 marks)

Consider 
$$f(x) = x^3 - x^2 + 4x - 4$$

i) Show that  $(x - 2i)$  is a factor of  $f(x)$ 

ii) Determine three linear factors of f(x)

Q2 (5 marks)

Consider 
$$f(x) = x^3 + bx^2 + cx + 8$$
 where  $b \& c$  are constants. Given that  $(x + 2)$  is a factor of  $f(x)$  and when  $f(x)$  is divided by  $(x - 3)$  has a remainder of  $-10$ . Determine  $b \& c$ .

Q3 (3 marks)  $f(x) = \sqrt{x+2} \text{ and } g(x) = 5x - 3 \text{ . Does } f \circ g(x) \text{ exist over the natural domain of } g \text{? Explain your answer.}$ 

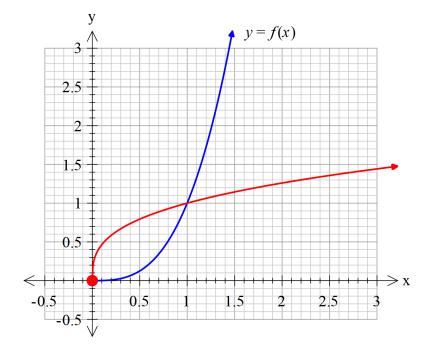
Q4 (2 & 2 = 4 marks)

Given that 
$$f(x) = \sqrt{x}$$
 and  $h(x) = \frac{1}{x^2 + 5}$ .

- i) Determine the rule of  $h \circ f(x)$
- ii) State the natural domain and range of  $h \circ f(x)$

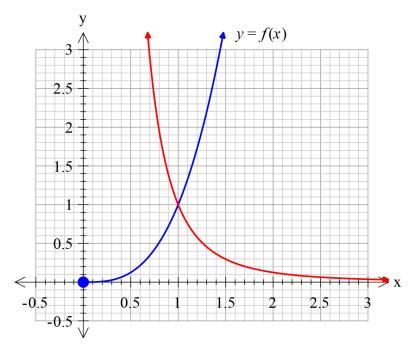
$$Q5 (3 \& 3 = 6 \text{ marks})$$

i) On the diagram, sketch the inverse function  $f^{-1}(\chi)$ 



$$y = \frac{1}{f(x)}$$
On the diagram below, sketch





Q6) (1, 1, 2 & 2= 6 marks)

$$f(x) = \frac{cx + d}{ax + b}$$
 where  $a, b, c \& d$  are non-zero constants.

- Determine the natural domain of fi)
- Determine the limit that f approaches as  $X \to \pm \infty$ ii)
- Determine the inverse function  $f^{-1}(x)$  in terms of a,b,c & d. iii)
- Determine the possible values of a,b,c & d if  $f=f^{-1}$ . iv)

Q7 (4 marks)

Consider the equation |2x+5| = p|x+q| + r which is true and only true for  $\frac{-5}{2} \le x \le 3$ . Determine the possible values of the constants p,q & r.

Q8 ( 4 marks)

Let 
$$z = \cos(2\theta) + i\sin(2\theta)$$
, prove that  $\frac{1+z}{1-z} = \frac{i}{\tan \theta}$