

Mathematics 2200
Pre-Final - June 2014

Mathematics 2200 Pre-Exam - June 2014
Answer Sheet

Name: _____

Mathematics Teacher: _____

1. A ~~B~~ C D
2. A ~~B~~ C D
3. ~~A~~ B C D
4. A B C ~~D~~
5. A B ~~C~~ D
6. ~~A~~ B C D
7. A B C ~~D~~
8. ~~A~~ B ~~C~~ D
9. A ~~B~~ C D
10. ~~A~~ B C D
11. A B ~~C~~ D
12. ~~A~~ B ~~C~~ D
13. A B C ~~D~~
14. A B ~~C~~ D

15. A B C ~~D~~
16. A ~~B~~ C D
17. A ~~B~~ C D
18. A B ~~C~~ D
19. ~~A~~ B C D
20. A B C ~~D~~
21. ~~A~~ B C D
22. ~~A~~ B C D
23. ~~A~~ B C D
24. ~~A~~ B ~~C~~ D
25. A B ~~C~~ D

Constructed Response:

Answers to be written on this paper in the space provided. Show all workings.

26. A theatre has 10 seats in the first row. Each row has 3 more seats than the previous row, and there are 20 rows in total. Algebraically determine the total capacity of the theatre. [3 marks]

$$10, 13, 16, \dots$$

$$S_{20} = \frac{20}{2}(10 + 67)$$

$$= 770$$

$$\therefore t_n = 10 + (n-1)(3)$$

$$t_n = 3n + 7$$

$$t_{20} = 3(20) + 7$$

$$t_2 = 67$$

27. The first three terms of a geometric sequence are $\{x+3, 2x+2, 4x-2, \dots\}$. Algebraically determine the value of x . [3 marks]

$$\frac{2x+2}{x+3} = \frac{4x-2}{2x+2}$$

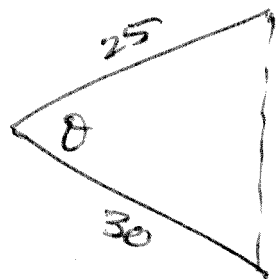
$$(2x+2)(2x+2) = (4x-2)(x+3)$$

$$4x^2 + 8x + 4 = 4x^2 + 10x - 6$$

$$-2x = -10$$

$$x = 5$$

28. Two sailboats leave the same point at the same time, travelling in different directions. One boat travels at 5 km/h and the other travels at 6 km/h. If the boats are 42 km apart after 5 hours, find the measure of the angle between the paths of the boats. [3 marks]



$$42^2 = 25^2 + 30^2 - 2(25)(30)(\cos \theta)$$

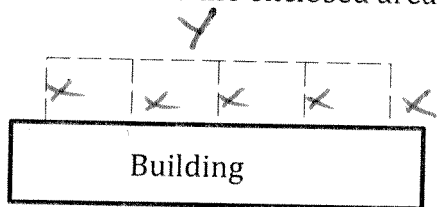
$$\frac{239}{-1500} = \frac{-1500}{-1500} \cos \theta$$

$$\cos^{-1}\left(\frac{239}{1500}\right) = \theta$$

$$\theta = 80.8^\circ$$

but Neg so use Quad 2
 $\therefore \theta = 180 - 80.8$
 $\theta = 99^\circ$

29. Four equivalent rectangular areas are enclosed along the side of a building as shown. If 80 m of fencing is used, algebraically determine the dimensions that will maximize the enclosed area. [4 marks]



$$5x + y = 80$$

$$y = 80 - 5x$$

$$A = (x)(y)$$

$$A = x(80 - 5x)$$

$$A = -5x^2 + 80x$$

$$x = \frac{-b}{2a} = \frac{-80}{2(-5)} = 8$$

$$y = 80 - 5(8)$$

$$y = 40$$

30. State **restrictions** on the variable and algebraically determine the **exact** roots, in simplest form, for: [4 marks]

$$\sqrt{n+5} - n = -4$$

$$(\sqrt{n+5})^2 = (n-4)^2$$

$$n+5 = n^2 - 8n + 16$$

$$0 = n^2 - 9n + 11$$

$$n = \frac{9 \pm \sqrt{(-9)^2 - 4(1)(11)}}{2(1)}$$

$$= \frac{9 \pm \sqrt{37}}{2}$$

REST

$$n+5 \geq 0$$

$$n \geq -5$$

31. Identify all non-permissible values and solve:

[4 marks]

$$\frac{3y}{y^2-1} + \frac{2}{y} = -4$$

THIS QUESTION SHOULD HAVE BEEN:

$$\left[\frac{3y}{(y+1)(y-1)} + \frac{2}{(y+1)} = -4 \right] (y+1)(y-1)$$

$$y \neq \pm 1$$

$$3y + 2(y-1) = -4(y+1)(y-1)$$

$$3y + 2y - 2 = -4y^2 + 4$$

$$4y^2 + 5y - 6 = 0$$

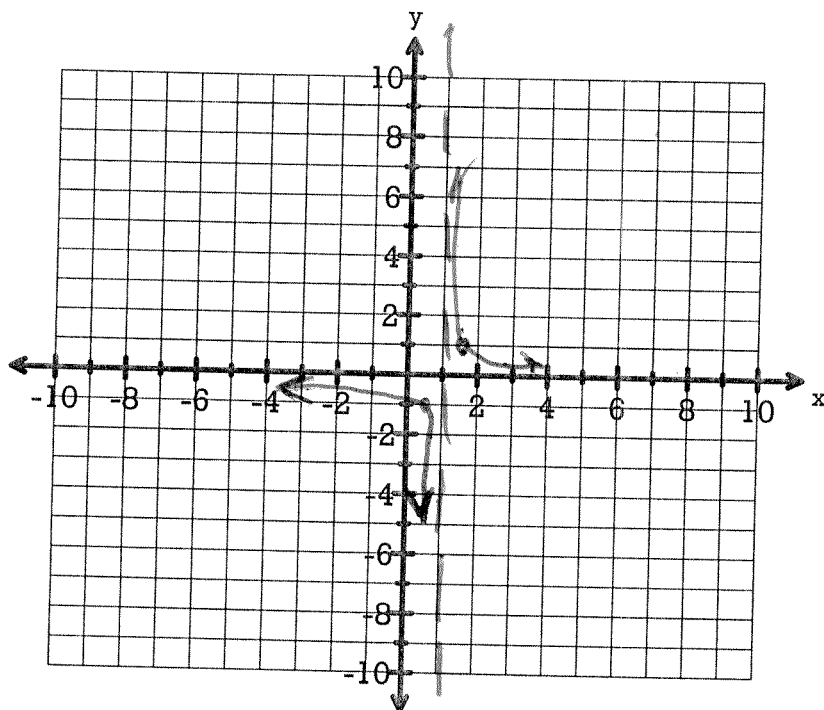
$$(y+2)(4y-3) = 0$$

$$y = -2 \quad \left| \quad y = \frac{3}{4}$$

32. Algebraically determine the invariant points, equations of asymptotes, and

[4 marks]

x- and y-intercepts for the functions $f(x) = 4x - 4$ and $y = \frac{1}{f(x)}$. Sketch both graphs on the same set of axes.



H.A

$$4x - 4 = 0$$

$$4x = 4$$

$$x = 1$$

INV. Pts

$$4x - 4 = 1$$

$$4x = 5$$

$$x = \frac{5}{4}, y = 1$$

$$4x - 4 = -1$$

$$\frac{4x}{4} = \frac{3}{4}$$

$$x = \frac{3}{4}, -1$$

33. Solve algebraically:

$$|x^2 + 2x| = x + 2$$

[4 marks]

$$\begin{aligned} x^2 + 2x &= x + 2 \\ x^2 + x - 2 &= 0 \\ (x+2)(x-1) &= 0 \\ x = -2 \quad \checkmark & \quad x = 1 \quad \checkmark \end{aligned} \left\{ \begin{aligned} x^2 + 2x &= -(x+2) \\ x^2 + 2x &= -x - 2 \\ x^2 + 3x + 2 &= 0 \\ (x+2)(x+1) &= 0 \\ x \neq -2 \quad \checkmark & \quad x = -1 \quad \checkmark \end{aligned} \right.$$

$$\begin{aligned} x^2 + 2x &= 0 \\ x(x+2) &= 0 \\ x = 0 \quad \checkmark & \quad x = -2 \quad \checkmark \end{aligned}$$

$$\begin{aligned} f(x) &= (x^2 + 2x), \quad x \leq -2, x \geq 0 \\ -(x^2 + 2x) &= -2 < x < 0 \end{aligned}$$

34. Algebraically determine the points of intersection of $4 - x^2$ and $y = 3x^2 - 2x - 2$

4
[3 marks]

$$\begin{aligned} 3x^2 - 2x - 2 &= 4 - x^2 \\ 4x^2 - 2x - 6 &= 0 \\ 2(2x^2 - x - 3) &= 0 \\ (2x - 3)(x + 1) &= 0 \\ x = \frac{3}{2} \quad \checkmark & \quad x = -1 \quad \checkmark \end{aligned} \left\{ \begin{aligned} x = \frac{3}{2} \\ y &= 4 - \left(\frac{3}{2}\right)^2 \\ y &= 4 - \frac{9}{4} \\ y &= \frac{7}{4} \end{aligned} \right. \left\{ \begin{aligned} x = -1 \\ y &= 4 - (1)^2 \\ y &= 3 \end{aligned} \right.$$

35. A toy rocket is launched from the roof of a house. Its height, h , in metres above the ground is given by $h(t) = -5t^2 + 30t + 6$, where t is time in seconds. Algebraically determine for how long the rocket is above a height of at 46 m.

4
[3 marks]

$$\begin{aligned} -5t^2 + 30t + 6 &> 46 \\ -5t^2 + 30t - 40 &> 0 \\ -5(t^2 - 6t + 8) &> 0 \\ \frac{-5}{-5} t^2 - 6t + 8 &< 0 \\ (t - 4)(t - 2) &< 0 \\ t = 4 \quad \checkmark & \quad t = 2 \quad \checkmark \end{aligned}$$

\therefore BETWEEN 2 + 4 sec.
So $4 - 2 = 2$ seconds
Above 46 m.