CHURCHLANDS SENIOR HIGH SCHOOL
MATHEMATICS SPECIALIST 3, 4 TEST TWO 2017
Non Calculator
Chapters 3, 4,

Name_____ **Time: 40minutes**
Total: 41 marks

1. [8 marks: 1,1,2,2,2]

Given that $f(x)=\frac{1}{x+2}$ and $g(x)=x-5$

a) State the natural domain of g.

b) Explain clearly why the domain for g has to be restricted if fog is to be a function.

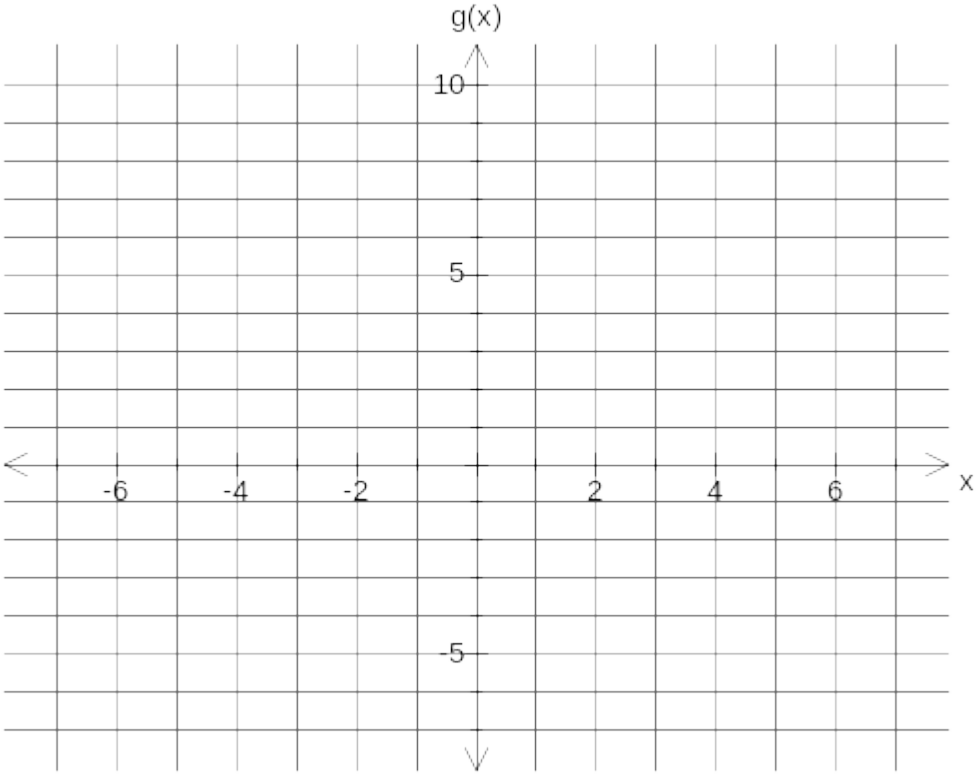
c) State the largest possible domain for fog and the corresponding range.

d) Evaluate $gof(\frac{-5}{2})$.

e) Express in simplest form $fof(x)$.

2.[11 marks:2,1,3,2,1,2]
$g(x)=x^2+6x+7$ *for* $x \epsilon ¿$.

a) Sketch the graph of g on the axes provided.



b)Explain why $g(x)$ has an inverse function $g^{-1}(x)$.

c) Find algebraically, a formula for $g^{-1}(x)$.

d) Sketch the graph of $g^{-1}(x)$ on the same axes as $g(x)$ above.

e) Find the range of $g(x)$.

f) Find the domain and range of $g^{-1}(x)$.

3.[12 marks:2,1,2,2,5]

Consider the curve with equation $y=\frac{x^2-9}{x^2+x-6}$

a) State the equation of all asymptotes.

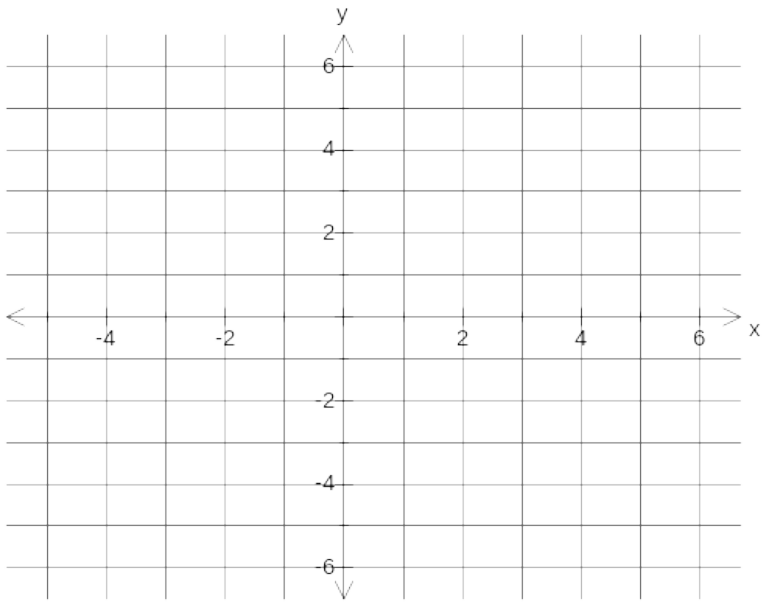
b) Identify the point of discontinuity on this curve.

c) State the x and y intercepts

d) i) State the limit as $x \to +\infty$

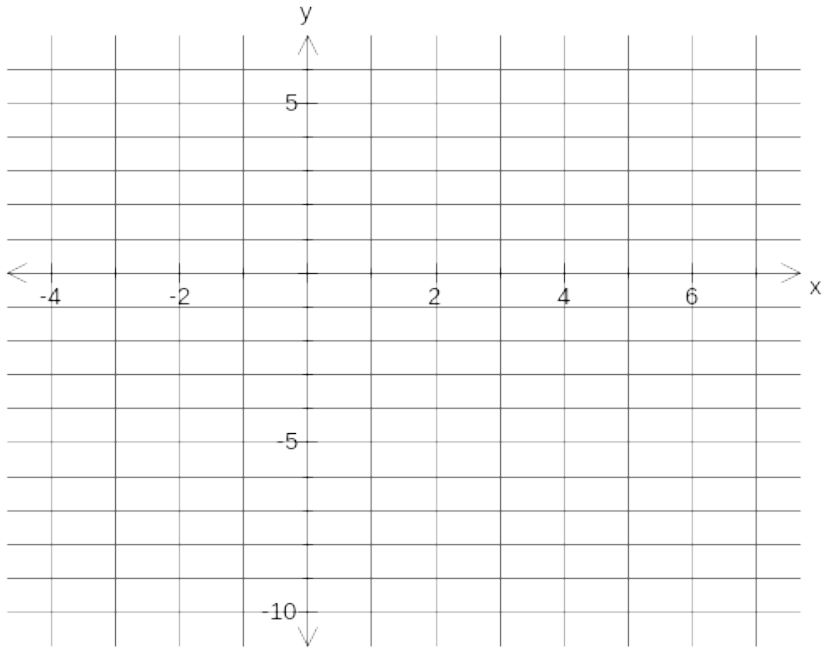
ii) State the limit as $x \to -\infty$

e) Sketch the curve on the axes provided highlighting all the main features clearly.



4.[7 marks:3,3]

a) On the axes provided neatly sketch the graph of $y=x^2-2x-8$.
Clearly indicate the i) $x$intercepts
ii) the $y$intercept
iii) the coordinates of the turning point.



b) Use your previous graph to help you draw the graph of $y=\dfrac{1}{x^2-2x-8}$ on the same set of axes.
Clearly indicate any asymptotes, turning points, intersection with axes and behaviour as $x \to \pm\infty$.

5. [3 marks]

The equation $|x-4|=|2x+k|$ has exactly two solutions $x=-5$ and $x=1$.
Find the value(s) of k.

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Calculator Section
Chapters 3, 4,

Name_____ **Time: 15 minutes**
Total: 14 marks

1. [9 marks: 2,1,2,4]

The position vectors of A and B, t hours after 10 am are $r=-4i-4j+t(2i+3j)$ and $r=3i+10j+t(ai+j)$ respectively.

a) Find the vector **AB** t hours after 10 am.

b) Find in terms of a and t, the distance between A and B, t hours after 10 am.

c) Explain why when collision between A and B occurs, $AB=0i+0j$.

d) Find the value of a if the two particles never collide.

2. [5 marks]
Find the parametric and hence the Cartesian equation of the line perpendicular to the vector $3i-7j$ and passing through the point (-9,12).

4. [7 marks:2,2,3]
Solve the following
a) $|x-8| \geq 3$

b) $|x+3| = 5x-1$

c) $|x-5| \leq |3x+1|$

5. [4 marks]
Given that $f(x)=3x+7$ and $(f(x))=9x^2+42x+50$, find $g(x)$.