



ALL SAINTS'
COLLEGE

Mathematics
Specialist
Test 2 2016

Functions

NAME: _____
TEACHER: MLA

50 marks

50 minutes

SCSA formulae sheets, ClassPads and a double-sided A4 sheet of notes may be used

Question 1 [2 marks]

Use an algebraic method to solve $|2x - 4| = 10$.

Question 2 [4 & 1 = 5 marks]

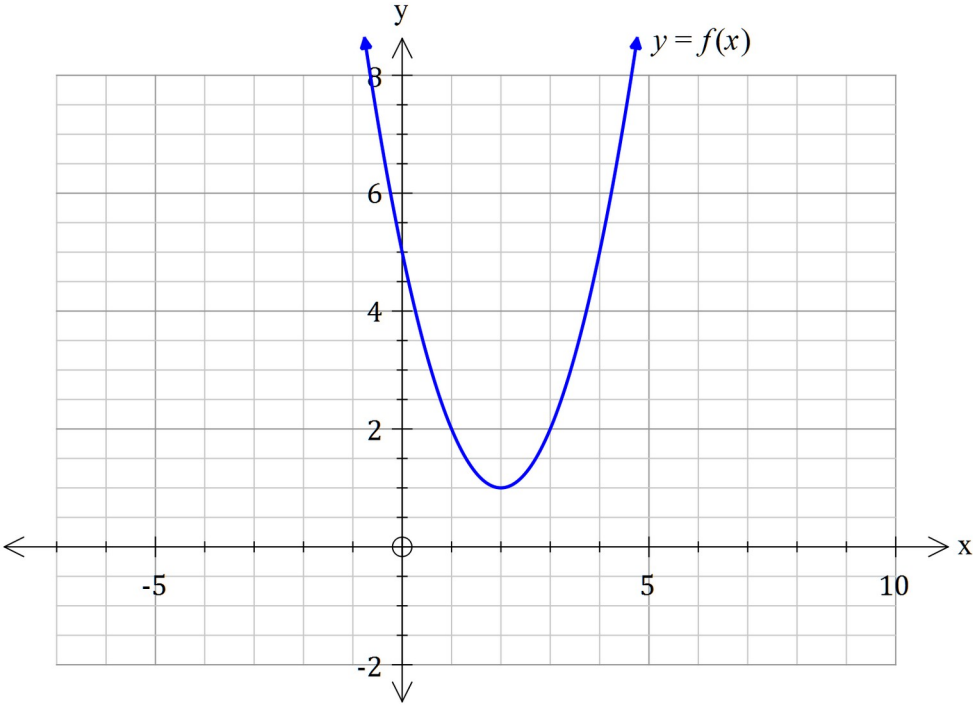
(a) If $f(x) = -(x^2 + 3x - 10)$, express $|f(x)| \wedge f(|x|)$ as piecewise functions.

(b) Using your ClassPad, or otherwise, solve $|f(x)| = f(|x|)$.

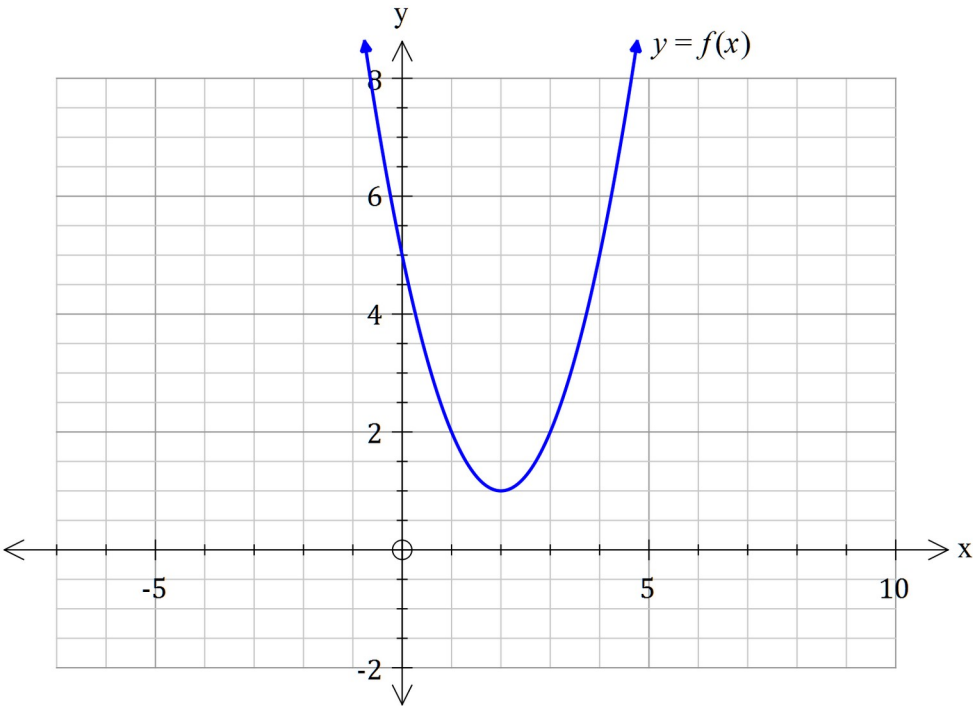
Question 3 [3 & 3 = 6 marks]

On the axes provided, sketch the following functions:

(a) $y=f^{-1}(x)$



(b) $y=\frac{1}{f(x)}$

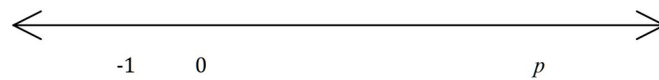


Question 4 [3 marks]

If $f(x) = 2x^2$ and $g(x) = \sqrt{2-x}$, state the rule for $fg(x)$ and find its domain and range.

Question 5 [3 marks]

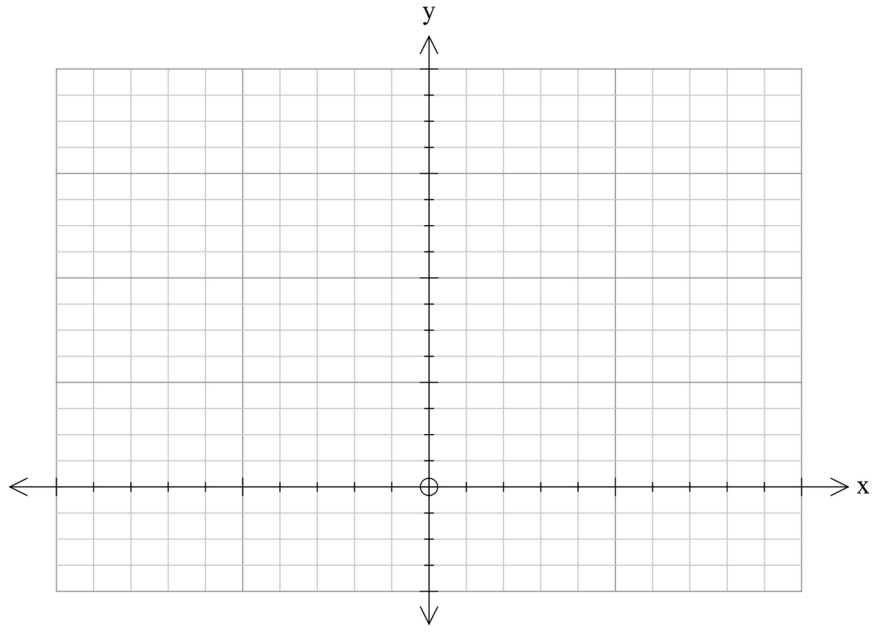
With reference to the number line drawn below, determine the appropriate inequality symbol for \blacksquare , and find the values of p and k if $|2x-4| \blacksquare k$.



Question 6 [3 & 3 = 6 marks]

- (a) Sketch the graphs of $f(x)=|x+k|, k>0 \wedge h(x)=|2x-k|, k>0$

Be sure to label each graph and to identify all intercepts



- (b) Hence, determine the value(s) of x for which $f(x) \leq h(x)$

Question 7 [3 marks]

Consider $f(x) = \frac{cx+d}{x+e}$, where $c, d \wedge e$ are integers

$f(x)$ has the following characteristics:

- vertical asymptote with equation $x = -4$
- root (zero) at $x = 4$
- intercept at $(0, 2)$

Find the values of $c, d \wedge e$.

Question 8 [3 & 5 = 8 marks]

(a) Express $f(x) = x^2 + 2|x - 1|$ in piecewise form.

(b) (i) Express $f(x) = |x - 8| + |2 - x|$ as a piecewise function.

(ii) $|x - 8| + |2 - x| = 4x + 4$ when $x = 1$

State the equation used to obtain this solution.

Question 9 [1, 2, 1, 1, 1 & 1 = 7 marks]

Consider $f(x) = 2 + (x - 1)^2$, where $x \in \mathbb{R}$

- (a) Find $f(0) \wedge f(2)$
- (b) Use your answers in (a) to show that $f(x)$ does not have an inverse function
- (c) Determine the largest possible domain for $f(x)$, consisting only of positive numbers, so that $f(x)$ has an inverse function
- (d) State the range for $f(x)$ that corresponds with your domain in (c)
- (e) Using your ClassPad, or otherwise, determine the rule for the inverse of $f(x)$ that corresponds with your domain in (c)

- (f) State the domain and range for $f^{-1}(x)$

Question 10 [5, 2 = 7 marks]

Consider $f(x) = \frac{x^2 + 2x + 1}{x - 2}$

- (a) Using your ClassPad, or otherwise, determine the following:

(i) Stationary points

(ii) Intercept(s)

(iii) Asymptotes

- (b) Investigate the behaviour of $f(x)$ as $x \rightarrow \pm\infty$

End of Test 2