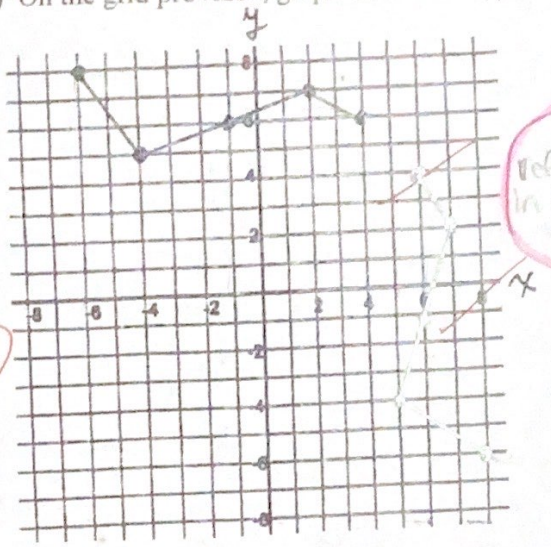
MHF-4U **QUIZ # 3** (Knowledge & Understanding) [redacted] 20/30

1. a) On the grid provided, graph the inverse ($y = f^{-1}(x)$) of the given function ($y = f(x)$). (2)



b) What is the mathematical relationship between the two graphs. (1)

reflection in the line $y=x$

The value of the independant and dependant variables are switched, the domain and range is switched too

c) Is the inverse of $y = f(x)$ a function ? (1)

No, it does not pass the vertical line test

2. For $k(x) = 3(x+7)^2 - 5$

a) State the domain and range of $y = k(x)$. (2)

$D=\{x \in R\}$

$R=\{y \in R \mid y \geq -5\}$

b) State the domain and range of $y = k^{-1}(x)$. (2)

$R=\{y \in R\}$

$D=\{x \in R \mid x \geq -5\}$

c) Find the equation ($y = k^{-1}(x)$) for the inverse of $y = k(x)$. Show all steps. (4)

$k(x) = 3(x+7)^2 - 5$

$y = 3(x+7)^2 - 5$

$x = 3(y+7)^2 - 5$

$x+5 = 3(y+7)^2$

$\pm\sqrt{\frac{x+5}{3}} - 7 = y$

d) Restrict the domain of $k(x)$ so that $k^{-1}(x)$ is a function. (1)

$D=\{x \in R \mid x \geq -7\}$

restrict the horizontal shift value, -7 (switch sign)

x of vertex

3. For $f = \{(3,4), (5,6), (7,8), (9,10), (11,12)\}$ and $g = \{(1,7), (3,8), (5,-2), (8,11), (11,5)\}$ find. (3)

a) $f+g$ $(3,12), (5,4), (11,17)$

b) $g-f$ $(3,4), (5,-8), (11,-7)$

c) fg $(3,32), (5,-12), (11,60)$

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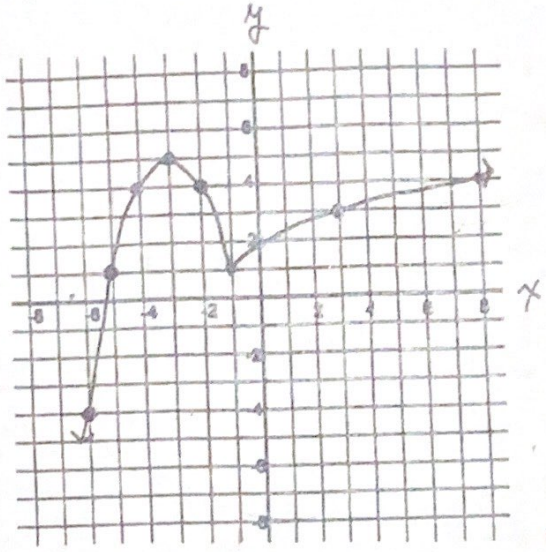
4. a) Write the algebraic representation (equations) for the given graph.



(4) a) $f(x) = \begin{cases} -(x+3)^2+5, & \text{if } x \le -1 \\ \sqrt{x+1}+1, & \text{if } x > -1 \end{cases}$

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b) Is the graph continuous? Explain mathematically.

(2) Yes, because there are no holes or discontinuities (you can draw the function without lifting your pencil)

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5. A piece-wise linear graph is represented by the following equations.

$f(x) = 3$ if $x < 4$

$f(x) = \frac{1}{2}x + 1$ if $4 \le x < 8$

$f(x) = -3x + 33$ if $8 \le x \le 10$

(5)

a) Is $y = f(x)$ a continuous function? Prove mathematically and explain.

a) at $x=4 \rightarrow f(4)=3$, $f(4)=\frac{1}{2}(4)+1 = 3$

b) at $x=8$, $f(8)=\frac{1}{2}(8)+1=5$ ∴ continuous

does not make it discontinuous $f(8) = -3(8)+33 = 9 \rightarrow$ not continuous

Yes, because from $-\infty$ to 3.999, $f(x)=3$, then $f(x)=\frac{1}{2}x+1$ for anywhere from 4 to just before 8, and then $f(x)=-3x+33$ includes 8 and goes right up to 9.9999... you do not have to lift your pencil to draw it

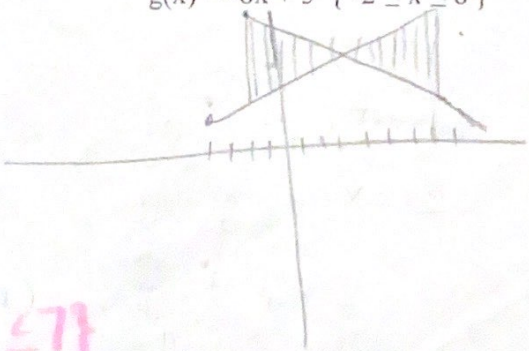
6. a) Determine the equation for $h(x) = f(x) \times g(x)$ if $f(x) = 7x + 4$ $\{-4 \le x \le 7\}$ and $g(x) = -6x + 5$ $\{-2 \le x \le 8\}$

$h(x) = f(x) \cdot g(x)$

$= (7x+4)(-6x+5)$

$= -42x^2 + 35x + 20 - 24x$

$= -42x^2 + 11x + 20$



b) State the domain of $y = h(x)$.

$D = \{x \in \mathbb{R}\}$

$D = \{x \in \mathbb{R} \mid -2 \le x \le 7\}$ (use the domain that overlaps)

(1) to graph: sub in endpoints $x+1$, $\frac{1}{2}x+1$, if $4 \le x < 8$, sub in 4 and 8, you get (1)3 and 5, then connect

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