Test #1 (/30) **Name (print):** _____ **Student Number:** _____

Part A: Short Answer (1 Mark Each)

Question 1: Consider the transformation formula: $y = a[f(b(x-c))] + d$. What does the b-value do to the graph? _____divides the x values by b_____

Question 2: Simplifying $e^{2\ln(3)} + \log_4 12 - \log_4 3 + 3\log_2 1$ produces:

a) 3 b) 7 c) 10 d) 11 e) 13

Question 3: Given $f(x) = x^2 + 1$ and $g(x) = 2x - 3$, the simplified equation for $f \circ g(x+1)$

a) $4x^2 - 12x + 10$ b) $4x^2 - 8x + 5$ c) $2x^3 - 3x^2 + 2x - 2$ d) $4x^2 - 4x + 2$

Question 4: State the change of base formula to change $\log_2 x$ into an expression that only has $\log_5$

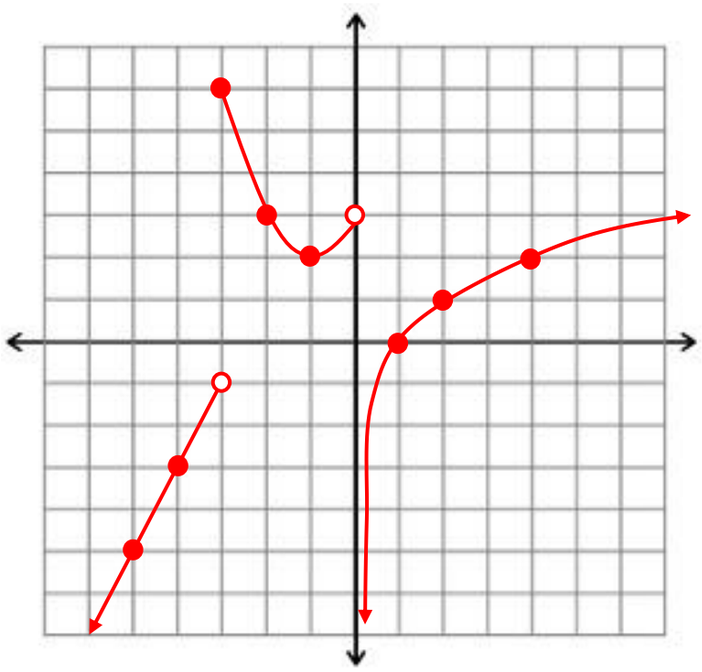
$$\log_2 x = \frac{\log_5 x}{\log_5 2}$$

Question 5: Write the following function as a piecewise function: $g(x) = |x|$

$$g(x) = \begin{cases} x & x \geq 0 \\ -x & x < 0 \end{cases}$$

Part B: Short Answer Choice (Show all work)

Question 1: Using the grid below, answer the questions that are given:



a) Provide a graph for the following piecewise function: (3 Marks):

$$f(x) = \begin{cases} 2x + 5 & x < -3 \\ (x+1)^2 + 2 & -3 \leq x < 0 \\ \log_2 x & x > 0 \end{cases}$$

[1 Mark for each correct piece]
[Remove ½ Mark for each missing hole]
[Remove ½ mark if one or more arrows are missing]

b) The Domain of this function is: (1 Mark)

$$D = \{x \in R | x \neq 0\}$$

c) The Range of this function is: (1 Mark)

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

Question 2: Solve the following equation: $-e^{-2x+1} + 10 = 8$. (3 Marks)

$-e^{-2x+1} = -2$

$e^{-2x+1} = 2$ [1 Mark]

$\ln(e^{-2x+1}) = \ln(2)$ [1 Mark]

$-2x + 1 = \ln(2)$

$x = \frac{\ln(2)-1}{-2}$ [1 Mark]

Question 3: Determine the Domain of the following function: $f(x) = \sqrt{-2x-4} + \frac{1}{x^2-25}$ (3 Marks)

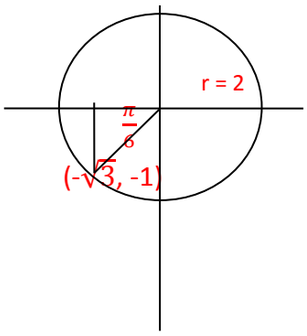
$$D = \{x \in R | x \leq -2 \text{ and } x \neq -5\}$$

or

$$D = (-\infty, -5) \cup (-5, -2]$$

[2 Marks for correct domain from the root function]
[1 Mark for correct domain from the rational function]
[Remove 0.5 marks if the domain is not simplified (ie if they wrote $D = \{x \in R | x \leq -2 \text{ and } x \neq \pm 5\}$)]

Question 4: Simplify: $ArcCos\left(Sin\left(-\frac{5\pi}{6}\right)\right)$ (4 Marks)

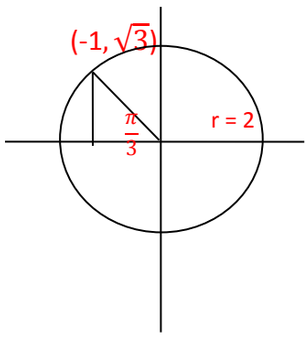


$= Arccos(\frac{-\sqrt{3}}{2})$

Thus we solve: $Cos(\theta) = -1/2$

But for arccos, the range is

$0 \leq \theta \leq \pi$



$\theta = \frac{2\pi}{3}$

$Arcsin\left(Cos\left(\frac{3\pi}{4}\right)\right) = \frac{2\pi}{3}$

[1 Mark for first diagram (or justifying the Sin Ratio)]
[1 Mark to know we solve $Cos(\theta)$ in the proper domain]
[1 Mark for second diagram (justifying solving Arccos in some manner)]
[1 Mark for final answer]

Question 5: Determine the inverse of the f(x). State if the inverse is a function and how you know if it is a function. If the inverse is not a function, state a restriction on the domain of the **original function f(x)** so that the inverse will be a function (with the largest domain possible): $f(x) = -4(x-3)^2 + 2$ (5 Marks)

$f(x) = -4(x-3)^2 + 2$
$y = -4(x-3)^2 + 2$
$x = -4(y-3)^2 + 2$ [1 Mark]
$x - 2 = -4(y-3)^2$
$\frac{x-2}{-4} = (y-3)^2$
$\pm\sqrt{\frac{x-2}{-4}} = y - 3$
$3 \pm \sqrt{\frac{x-2}{-4}} = y$ [1 Mark]

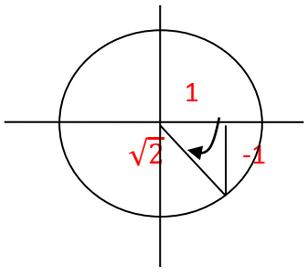
This is not a function as we have $\pm$ which allows for a choice of two outputs for almost every input (also the original fails the HLT). [1 Mark for it is not a function, 1 Mark for reasoning, only take of one mark if they forgot the $\pm$, but said it was a function]

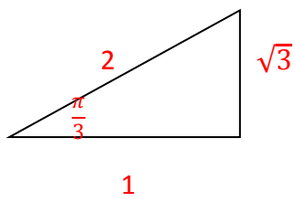
To make the inverse a function, we would need to restrict the original function to a Domain of either $D = \{x \in R | x \geq 3\}$ *or* $D = \{x \in R | x \leq 3\}$ [1 Mark]

Question 6: Determine the exact value for $Sin\left(\frac{\pi}{12}\right)$ (5 Marks)

(note there are other ways to split up the angle to answer the question all of which would be acceptable)

$= Sin\left(\frac{\pi}{3} - \frac{\pi}{4}\right)$
$= Cos\left(\frac{\pi}{3}\right)Sin\left(\frac{-\pi}{4}\right) + Sin\left(\frac{\pi}{3}\right)Cos\left(\frac{-\pi}{4}\right)$
$= \left(\frac{1}{2}\right)\left(\frac{-1}{\sqrt{2}}\right) + \left(\frac{\sqrt{3}}{2}\right)\left(\frac{1}{\sqrt{2}}\right)$
$= \frac{-1+\sqrt{3}}{2\sqrt{2}}$





[1 Mark knowing to split the angle]
[1 Mark to knowing that we can use an identity]
[1 Mark knowing the diagrams (or other justification that is reasonable)]
[1 Mark finding the correct special triangle ratios]
[1 Mark for simplifying to the final answer (no rationalization needed)]