Serial #: _____   ID _____ NAME _____

Show all necessary steps for full marks.

Question 1: (5 points): If $f(x) = 1 + 5\ln 2x$, then $f^{-1}(x) = ?$

Solution:

Q2.

If $f(x) = 1 + 5\ln 2x$, then $f^{-1}(x) =$

✔ A) $\dfrac{1}{2}e^{(x-1)/5}$

$y = 1 + 5\ln 2x$

B) $1 + 5e^{2x}$

$x - 1 = 5\ln 2y$

C) $e^{(x+1)/10}$

$\dfrac{x-1}{5} = \ln 2y$

D) $1 - \dfrac{1}{2}e^{5x}$

$2y = e^{\frac{x-1}{5}} \Rightarrow y = \frac{1}{2}e^{\frac{x-1}{5}}$

E) $1 - \log_5(2x)$
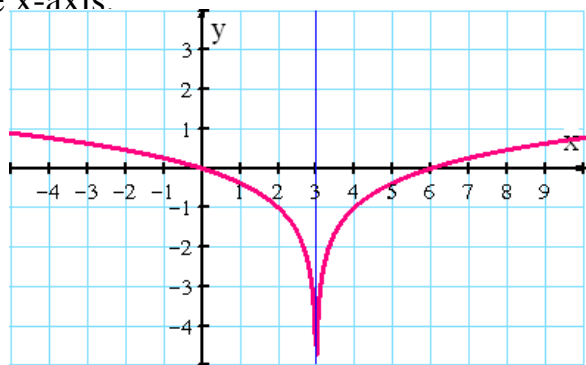
Question 2: (5 points):

(a): The graph of $y = \log_3|x - 3| - 1$

(b): Find the intervals where the graph is below the x-axis.

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Solution:

$y = \log_3|x - 3| - 1$

$= \begin{cases} \log_3(x - 3) - 1 & \text{if } x > 3 \\ \log_3(3 - x) - 1 & \text{if } x < 3 \end{cases}$

$0 = \log_3|x - 3| - 1 \Rightarrow \log_3|x - 3| = 1 \Rightarrow 3^1 = |x - 3| \Rightarrow x - 3 = \pm 3 \Rightarrow x = 6, \; x = 0$

Question 3: (5 points): If $\log_3(5) = a$ and $\log_3(2) = b$, find $\log_{\sqrt{2}}(30)$ in terms of a and b.

Solution:

$\log_{\sqrt{2}}(30) = \dfrac{\log_3 30}{\log_3 \sqrt{2}} = \dfrac{\log_3(5)(6)}{\log_3 2^{1/2}} = \dfrac{\log_3(5) + \log_3(6)}{\dfrac{1}{2}\log_3 2} = \dfrac{a + \log_3(3)(2)}{\dfrac{1}{2}(b)}$

$= \dfrac{a + \log_3(3) + \log_3(2)}{\dfrac{b}{2}} = \dfrac{a + 1 + b}{\dfrac{b}{2}} = \dfrac{2a + 2 + 2b}{b}$

Question 4: (5 points): Solve $\log(5 - x) + \log(-3 - x) = \log(1 - 8x)$

Solution: $\log(5 - x)(-3 - x) = \log(1 - 8x)$

$(5 - x)(-3 - x) = 1 - 8x$

$-15 - 5x + 3x + x^2 = 1 - 8x$

$x^2 + 6x - 16 = 0 \Rightarrow (x + 8)(x - 2) = 0$

$\Rightarrow \boxed{x = -8}, \; x = 2 \text{ rejected} \Rightarrow SS = \{-8\}$