MATH 30 - Precalculus, Version A

Second Midterm. Time allowed: 2 hours, 15 minutes. Professor Luis Fernández

Instructions:

- Write all your answers in the space provided, or attach sheets if you need more space.
- SHOW ALL YOUR WORK. Solutions without work shown will receive no credit.
- Non-graphing calculators are allowed. No notes or books allowed.
- The exam has 8 exercises. The points of each exercise are written on the left.
- The exam has a total of 110 points, with 10 extra credit points.
- [18] 1. Write the exact value (NO decimals) of

a)
$$\log_3 81 = 4$$

b)
$$\log_5 \sqrt[4]{5} = \frac{1}{4}$$

c)
$$1023^{\log_{1023} 5} = \boxed{5}$$

d)
$$\log_{4513} 4513^{13} = \boxed{13}$$

e)
$$\log_{16} 8 = \frac{3}{4}$$

$$2^{4x} = 2^{3} \Rightarrow 4x = 3, x = \frac{3}{4}$$

f)
$$\log_9 \frac{1}{27} = \boxed{-\frac{3}{2}}$$

$$9^{\times} = \frac{1}{27} \rightarrow 3^{2} \times 3^{-3}$$

$$=$$
 $2 \times = -3 = 3 \times = -\frac{3}{2}$

[6] 2. Convert the following from exponential form to logarithmic form.

$$\mathbf{a)} \ e^{x} = 8$$

b)
$$10^{x+3} = 16$$

[6] 3. Convert the following from logarithmic form to exponential form.

a)
$$\operatorname{Ln} y = 8$$

b)
$$\log_6(y+8) = x+3$$

$$6^{x+3} = y+8$$

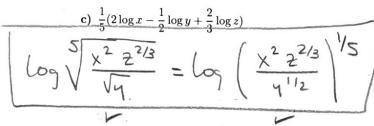
[8] 4. Condense the following logarithmic expressions (that is, write them using only one logarithm in the front).

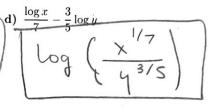
a)
$$4 \log x + 3 \log y$$

$$(\log (\chi^4 \gamma^3))$$

b)
$$12\log a - 2\log b + 5\log c$$

$$\log \left(\frac{\alpha^{2} c^{5}}{b^{2}}\right)$$





[8] 5. Expand the following logarithmic expressions (that is, write them using addition and subtraction of logarithms).

c)
$$\log_8\left(\frac{x^{12}}{7}\right)$$

$$12 \log_8 \left(\frac{x^{12}}{7}\right)$$

d)
$$\log (x^1 y^3)^5$$

$$5(4\log x + 3\log y)$$

- [4] 6. Write the following logarithms in the indicated base.
 - a) $\log_5 7$, in base 2.

$$\log_5 7 = \frac{\log_2 7}{\log_2 5}$$

b) $\log_7 5$, in base 10. $\log_7 5 = \log 5$ $\log 7$

[40] 7. Solve the following equations. If the answer is not an exact numbers, leave it expressed as a logarithm.

a)
$$7^{x+1}=49 \rightarrow 7^{x+4}=7^2 \Rightarrow x+4=2 \Rightarrow x=-2$$

Clean: $(-2)+4$
 $LHS=7=7=49=RHS$

b)
$$4^{z+3} = 8^{2z-1} \rightarrow 2^{2(x+3)} = 2^{3(2x-4)} \rightarrow 2(x+3) = 3(2x-4)$$

$$\Rightarrow 2x+6 = 6x-12 \rightarrow -4x = -18 \rightarrow x = \frac{-18}{-4} - \frac{9}{2}$$

$$CHECK$$

$$LHS = 4^{\frac{9}{2}+3} = 4^{\frac{15}{2}} = 2^{\frac{15}{2}}$$

$$2HS = 8^{\frac{9}{2}-4} = 8^{\frac{9}{2}-4} = 8^{\frac{9}{2}-4}$$

$$c) \log_{2}(x) - 3 = \log_{2}5 \rightarrow \log_{2}(x) = 3 + \log_{2}S \rightarrow \log_{2}(x) - \log_{2}S = 3$$

$$c) \log_{2}(x) - 3 = \log_{2}5 \rightarrow \log_{2}(x) = 3 + \log_{2}S \rightarrow x = 40$$

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$$c) \log_{2}(x) - \log_{2}5 \rightarrow x = 40$$

$$c) \log$$

RWS = (0/3 (2:03) -7) = 63 3=1~

- [20] **8.** For the rational function $f(x) = \frac{x^2 + 2x 3}{x^2 2x 3}$
 - a) Factor numerator and denominator and simplify if possible.

$$f(x) = \frac{(x+3)(x-1)}{(x-3)(x+1)}$$

b) Find the x intercepts of the graph of y = f(x), if they exist.

$$(x+3)(x-1)=0 \Rightarrow x=-3 \text{ or } x=1$$

c) Find the y intercepts of the graph of y = f(x), if they exist.

$$f(0) = \frac{-3}{-3} = 1$$

d) Find any vertical asymptotes.

Find any vertical asymptotes.
$$(x-3)(x+1)=0 \implies x=3 \text{ and } x=-1$$

e) Find any horizontal asymptotes.

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As
$$x \to \pm \infty$$
, $f(x) \approx \frac{x^2}{x^2} = 1$.

The eigenvalues of the eigenva

f) Use the information above to sketch a graph of y = f(x).

$$4(5) = \frac{(5+3)(5-1)}{(5-3)(5+1)}$$

$$= \frac{8\cdot4}{2\cdot6} = \frac{8}{3} \times 2.6$$

