J4 is the only new problem for test 3 so far.

Name (Print) ______________________________ SSN: ____________________

Circle the name of your TA and Discussion Hour:
David Krebes 8 AM 11 AM

Qihui Liu: 8am 9am

Jukun Ying 9am 11 am

Answer all questions and **SHOW ALL WORK**. No credit for answers only.

Part I: Multiple choice. No partial credit but SHOW WORK! Circle the letter corresponding to the correct answer.

1. The solution(s) to the equation

$$1/2 \ln_3(x+6) + \ln_3(x) = 0$$

are:

(A) 3

(B) -2

(C) $3, -2$

(D) no solutions

(E) 2.273

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2. Find a if the point $(1/8, -3)$ is on the graph of $f(x) = \log_a(x)$

(A) 1

(B) 2

(C) 3

(D) 4

(E) 5

3. The graph of $y = -3 + 4\ln(x+2)$ can be obtained from the graph of $y = 1/x$ by applying in order the following three transformations.
   1. vertical stretch by a factor of a
   2. horizontal shift of b units left or right
   3. vertical shift of c units up or down

What are the values of a, b, c and in which directions are the shifts?

(A) a =2, b=3 left, c =4 up

(B) a =2, b=3 right, c =4 up

(C) a =2, b= 2 right, c =3 down

(D) a =2, b= 2 right, c =3 up

(E) a =2, b= 2 left, c =3 down

(Partial credit) Write complete solutions and indicate your answers clearly.

4. The inverse of the function $f(x) = 3^{2x-1} - 5$ is:

(A) $\ln_2(x/2 + 1))$

(B) $\frac{1+\ln_3(x+5)}{2}$

(C) $\frac{\ln_3(5)+1}{2}$

(D) $\frac{\ln_3(5x)+1}{2}$

(E) $(1 + x)/2)$

Part II : (Partial credit) Write complete solutions and indicate your answers clearly.

5 Let $f(x) = -\ln((x-5)x)$. Sketch a complete graph of this function.

What is the domain of f?

Ans:____________________

What is the range of f?

Ans:____________________

What are the vertical asymptotes (if any) of f?

Ans:____________________

What are the horizontal asymptotes (if any) of f?

Ans:____________________

6. Sketch a compete graph of $\ln(x^2+1)$. Tell when it is increasing or decreasing.
7. A colony of e coli contains 10,000 individuals and increases at a rate of 4