

**Test #2**

**Directions:** Please show all work since partial credit is given, and answers without the necessary work will receive no credit. And remember to have fun!

1. Solve the following equations. Please give exact answers.

a)  $5^{3x-1} = \frac{1}{25}$  \_\_\_\_\_

b)  $-14 + 3e^{2x+1} = 10$  \_\_\_\_\_

c)  $\log_3(x^2) = 8$  \_\_\_\_\_

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

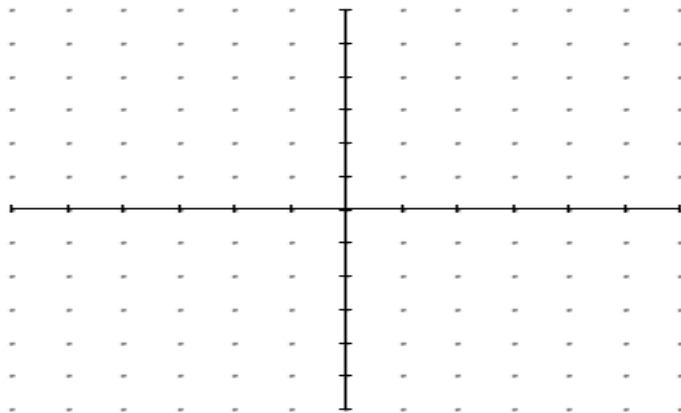
2. Let  $R(z) = \frac{z^2 - 5z + 4}{z^2 - 4}$ .

a) State the domain and range of  $R(z)$ . Domain: \_\_\_\_\_

Range: \_\_\_\_\_

b) Find the  $z$ - and  $y$ -intercepts of  $R(z)$ . \_\_\_\_\_

c) Sketch a graph of  $R(z)$  labeling all intercepts, asymptotes, and any additional points you find.



3. A biomedical researcher places approximately 175 thousand bacteria in a culture to study their growth. After 8 hours, there are 420 thousand bacteria in the culture.
- a) Assuming uninhibited exponential growth, find a model for the number of bacteria  $N(t)$ , where  $t$  is time in hours.

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- b) Use your model to find  $N(13)$  and interpret your answer in terms of the problem.

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- c) Estimate the time required for the bacteria population to double?

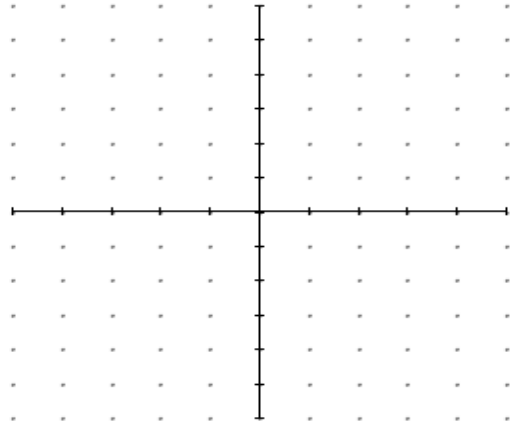
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4. Sketch a graph of the function  $f(x) = -6^{x-2} + 3$  as a transformation. State the parent (or toolkit) function and the corresponding transformations. Make sure to label all the necessary points and any asymptotes. Thanks!

Parent: \_\_\_\_\_

Transformations

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_



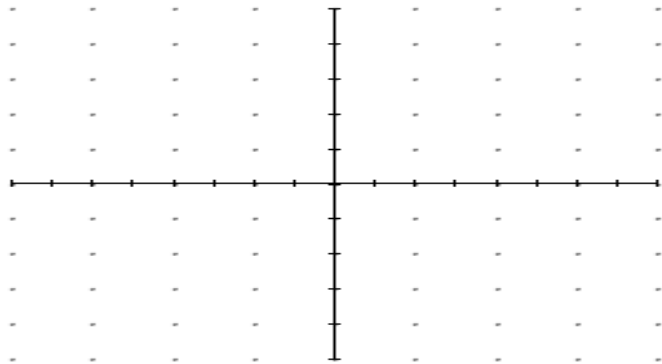
5. Let  $C(\theta) = 2 \csc\left(\theta + \frac{\pi}{4}\right)$ .

- a) State the domain and range of  $C(\theta)$ .

Domain: \_\_\_\_\_

Range: \_\_\_\_\_

- b) Sketch a graph of  $C(\theta)$ , labeling all major characteristics of the graph. Please graph two full periods of the function.



6. Simplify the following expressions.

a)  $\tan\left(\arcsin\left(-\frac{3}{4}\right)\right) = \underline{\hspace{2cm}}$

b)  $\sec^2 x - \sin^2 x \cdot \sec^2 x = \underline{\hspace{2cm}}$

7. Verify the identity

$$\frac{1}{1 + \sin(-u)} + \frac{1}{1 + \sin(u)} = 2 \sec^2 u$$

8. Find all the solutions of the following equations.

a)  $\sec^2 \theta = 4$  for  $0 \leq \theta < 2\pi$

\_\_\_\_\_

b)  $3\sqrt{3} \tan u + 4 = 7$

\_\_\_\_\_

c)  $2 \sin^2 x + 3 \sin x = 0$

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