Name ___________________________________ **Date** _______________________

Trigonometry & Precalculus **Mr. Lupinacci**

TEST #1

Exponential Growth

Calculators are NOT allowed for this page.
YOU MUST SHOW YOUR WORK TO RECEIVE CREDIT.

1. Evaluate: *(3pts each)*

   a) $\frac{3^8 \cdot 3^{-7}}{3^{-5}}$

   b) $\left(9^{\frac{3}{2}} + 8^{\frac{2}{3}}\right)^{-1}$

   c) $\sqrt{\frac{25^6}{125^2}}$

2. Simplify: $(2^{-1} - 4^{-1})^{-3}$

3. Solve for x: $27^{x-3} = 81^{x+2}$ *(3pts each)*

4. Solve: $8^{x} = 2^{7} \cdot 4^{9}$

5. Solve: $2x^{\frac{3}{2}} = 250$

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6. A house costs $400,000 ten years ago. Today it costs $480,000. To the nearest percent, what has been the annual rate of increase in the cost?

7. Suppose that $3,600 has been invested at a rate of 4.5%. How much will the investment be worth after 27 months if the interest is compounded:

   a) Quarterly

   b) Monthly

   c) Continuously

8. David buys a car for $35,000. The value of the car depreciates 11% per year. How much will the car be worth in 6 years?

9. If $h(x) = ab^x$, $h(0) = 5$, $h(1) = 15$, find *a* and *b*.

10. A colony of bacteria decays so that the population *t* days from now is given by: $A(t) = 3000\left(\frac{1}{2}\right)^{\frac{t}{5}}$.

(6pts)

a) What is the population when *t* = 0?

b) What is the half-life of this bacteria population?

c) What will the population be after 10 days?

d) What will the population be after 23days?

11. The population of a country grows at 2.7% per year. *(4pts)*

a) If the population is currently 45,000,000 people, what is the expected population in the year 2040?

b) According to the Rule of 72, how long will it take the population to double?

12. a) Find the value of $\left(1 + \frac{1}{n}\right)^n$ to the nearest thousandth for n = 1,000,000. *(2pts)*

b) What number does this result remind you of?

Formulas

$$y = ab^x$$

$$A(t) = A_0(1 + r)^t$$

$$A(t) = A_0 b^{\frac{t}{k}}$$

$$P(t) = P_0\left(1 + \frac{r}{n}\right)^{nt}$$

$$P(t) = P_0 e^{rt}$$