
Math 130 Exam 1 Sample 1

Directions: Do not simplify unless indicated. Non-graphing calculators are permitted. Show all work as appropriate for the methods taught in this course. Partial credit will be given for any work or words which are relevant to the problem. Units should be included for all real-world problems.

Please put problem 1 on answer sheet 1

- (a) Solve $25^{x+1} = 125^{2-x}$.
(b) Suppose $\ln a = 3$ and $\ln b = 2$. Simplify $\ln \sqrt{\frac{ab^3}{e^2}}$.
(c) Suppose a population grows by 5% per year. How long will it take to quadruple? Give an exact answer and an approximation to two decimal digits.
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Please put problem 2 on answer sheet 2

- When an antibiotic is introduced into a population of 6 thousand bacteria the population decreases exponentially. After 24 hours there are only 3 thousand bacteria.
 - Find a function $N(t)$ which gives the population of bacteria in thousands after t hours.
 - Find the average rate of change of the population during the first 24 hours. Give an exact answer and an approximation to two decimal digits.
 - Suppose the patient is considered cured (his own immune system can take care of the rest) when there are only five hundred bacteria present. How many hours will this take? Give an exact answer and an approximation to two decimal digits.
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Please put problem 3 on answer sheet 3

- At time t in seconds the height of a wave crashing against a cliff is given by

$$h(t) = 1.2 + 0.7 \sin \frac{1}{2} \left(t - \frac{\pi}{6} \right)$$

where h is measured in feet.

- Sketch the graph of one period of this function.
 - At what time does the maximum wave height occur?
 - What is this height?
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Please put problem 4 on answer sheet 4

- Calculate each of the following limits. Simplify all.

- $\lim_{x \rightarrow 7} \sqrt{\frac{x-1}{x^2+5}}$
 - $\lim_{x \rightarrow 2} \frac{x^2-4}{x^2-7x+10}$
 - $\lim_{x \rightarrow \infty} \frac{x^3+x}{x^2-x+1}$
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Please put problem 5 on answer sheet 5

- Use the limit definition of the derivative to calculate each of the following.
 - For $f(x) = 5x$ find $f'(2)$.
 - For $g(x) = x^2 - 3x$ find $g'(x)$.
 - Find the derivative of $\left(\frac{4}{x}\right)$.
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The End