

Course: AP Calculus AB

Topic: 2022 Summer Assignment

Name: _____

Date Due: First week of Class

Directions: Submit your answers with working on separate paper

1. In a certain town, the monthly charge for waste collection is \$8.00 for 32 gallons of waste and \$12.32 for 68 gallons of waste.
 - (a) Find a linear formula for the cost, C , of waste collection as a function of the number of gallons of waste, w .
 - (b) State the slope of the line found in part (a). Indicate units and interpret your answer in terms of the cost of waste collection.
 - (c) What is the vertical intercept of the line found in part (a) Indicate units and interpret your answer in terms of the cost of waste collection.

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2. Determine the domain of each function. Use interval notation to express your answer.

(a) $f(x) = \sqrt{2 + 6x}$

(b) $h(x) = \sqrt{x^2 - x - 6}$

(c) $f(x) = \frac{3x}{x^2 - 4x}$

(d) $g(x) = \frac{7}{x^2 + 5}$

(e) $g(x) = \ln(x + 3)$

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3. Classify the given functions as even, odd, or neither.

(a) $f(x) = x^2 \sin x$

(b) $h(x) = 2^{-x^2}$

(c) $g(x) = x^4 - 3x^2$

(d) $p(x) = \sin x \tan x$

4. Let the function h be defined by $h(z) = 2z^2 + 12z + 3$

- (a) Complete the square.
 - (b) Find the minimum or maximum value of h .
 - (c) State the range of h .
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5. Suppose that $Q = f(t)$ is an exponential function of t such that $f(20) = 88.2$, and $f(23) = 91.4$.

(a) Find the function Q . Express your answer using the two equivalent forms

$$y = ab^x \text{ and } y = ae^{(\ln b)x}$$

(b) Evaluate $Q(25)$

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6. The logistic growth model, given below represents the population (in grams) of a bacterium after t hours.

$$P(t) = \frac{1000}{1 + 32.33e^{-0.439t}}$$

- (a) Determine the carrying capacity of the environment.
 - (b) What is the growth rate of the bacteria?
 - (c) Determine the initial population.
 - (d) How long does it take for the population to reach one-half the carrying capacity?
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7. Solve the following equations or inequality.

(a) $2x^3 + 11x^2 - 7x - 6 = 0$

(b) $\frac{1}{x+2} > \frac{3}{x+1}$

(c) $3e^{x-1} + 1 = 11$

(d) $\log_4(x^2 - 9) - \log_4(x + 3) = 3$

(e) $\cos x - \sin 2x = 0, 0 \leq x \leq 2\pi$

8. Perform the following
(a) Expand and simplify using the Binomial Theorem.

$$(2y - 3)^4$$

- (b) Find the limit of:

$$\lim_{x \rightarrow -3} \left(\frac{x^2 + x - 6}{x^2 + 2x - 3} \right)$$

- (c) Use the formula for the sum of the first n terms of a geometric sequence to find the sum of

$$\sum_{i=1}^6 4(-2)^i$$

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Solve each problem

9. At a fixed temperature, the volume of a given mass of gas varies inversely as the pressure applied to the gas. A certain mass of gas has a volume of 40 cubic inches when the pressure is 22 pounds. What is the volume of the gas when the pressure is 30 pounds?
10. A bus company offers a travel club the following arrangements: If no more than 100 people go on a certain tour, the cost will be \$500 per person, but the cost per person will be reduced by \$4 for each person in excess of 100 who takes the tour.
- (a) Express the total revenue R obtained by the charter company as a function of the number of people who go on the tour.
- (b) Estimate the number of people that results in the greatest total revenue for the charter company.
- (c) What is the maximum revenue?

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11. For the function $g(x) = x^2 - 3x$, find the following.

- (a) the average rate of change from $x_1 = -2$ to $x_2 = 6$
- (b) the difference quotient $\frac{g(x+h) - g(x)}{h}$
- (c) $\lim_{h \rightarrow 0} \frac{g(x+h) - g(x)}{h}$