

1. REVIEW, CHAPTER 1.

1. Plutonium-240 decays exponentially at a continuous rate of 0.011%. What is the half-life of Plutonium-240?

2. The average temperature, T , in Tucson in June oscillates daily between 68° F at 5 am and 100° F at 5 pm. Write a formula for T in terms of t , measured in hours from 5 am.

3. Determine if the limit exists,

$$\lim_{x \rightarrow 3} f(x),$$

where

$$f(x) = \frac{x^3|2x - 6|}{(x - 3)}.$$

4. Which of the following functions has a limit as x approaches 0 but is not continuous at $x = 0$? (Explain your reasoning)

$$A. \quad f(x) = x \qquad B. \quad g(x) = \frac{x^2}{x} \qquad C. \quad h(x) = \frac{|x|}{x}.$$

5. Determine if the function

$$f(x) = \frac{e^x}{e^x - 1}$$

is continuous on the interval $[-1, 1]$.

6. Calculate the limit algebraically

$$\lim_{x \rightarrow \infty} \frac{ax^4 - bx^2}{cx^4 + d}, \quad \text{where } a, b, c, d \text{ are constants.}$$

7. Calculate the limit algebraically

$$\lim_{x \rightarrow \infty} \frac{3x^2 + x}{2x^3 - 1}$$

8. Determine if the limit exists

$$\lim_{x \rightarrow 2} \frac{|x - 2|}{x - 2}.$$

9. Find k so that the function is continuous on any interval

$$f(x) = \begin{cases} kx & \text{if } 0 \leq x < 3; \\ 3x^2 & \text{if } 3 \leq x. \end{cases}$$

10. Determine if the function, $f(x)$, is continuous at $x = 1$, where

$$f(x) = \begin{cases} 1 + \sin\left(\frac{\pi}{2}x\right) & \text{if } 0 \leq x \leq 1 \\ x^2 + 1 & \text{if } 1 < x \end{cases}$$

11. Find the formula for the function, $g(t)$, where $g(1) = 2$ and $g(4) = 8$, when
A $g(t)$ is linear.

B. $g(t)$ is exponential.

12. Find the vertical and horizontal asymptotes for the function,

$$h(x) = \frac{2x + 3}{x^2 - x - 2}$$

and draw the graph.

13. Given the function

$$f(x) = ax^3 + bx - c,$$

where a, b, c are positive constants.

A. Determine the end behavior of the function.

B. Is the function even, odd or neither even nor odd?

14. Solve for θ on the interval $[0, 2\pi)$,

$$\sin(2\theta) = -\frac{\sqrt{2}}{2}$$

15. Find the limit algebraically,

A.

$$\lim_{x \rightarrow \infty} \frac{3e^{2x} - 1}{2e^{2x} + 2}$$

B.

$$\lim_{x \rightarrow -\infty} \frac{3e^{2x} - 1}{2e^{2x} + 2}$$