

# Calculus Honors

## Homework-4 Q1

## Studyguide

### Exercise 1.

Find the following limits:

1.  $\lim_{x \rightarrow 1} x^{101} =$

2.  $\lim_{x \rightarrow 8} \sqrt[3]{x} =$

3.  $\lim_{x \rightarrow 2} x^3 - 2x^2 - 3x + 3 =$

4.  $\lim_{x \rightarrow 4} x^2 \sqrt{x} =$

5.  $\lim_{x \rightarrow 1} (3x^3 - 2x^2)^6 =$

6.  $\lim_{x \rightarrow 2} (x^4 - 2x^3 + 4x^2 - 8x + 1)^{2019} =$

7.  $\lim_{x \rightarrow 1} \frac{x^9 - 2x^7 + 4x^5 - 5x^4 + x^3 + 10x - 8}{x + 1} =$

8.  $\lim_{x \rightarrow 4} \frac{x^3 - 2x^2 - 3x - 10}{\sqrt{x}(x+1)} =$

9.  $\lim_{x \rightarrow 5} \sqrt{x - 5} =$

10.  $\lim_{x \rightarrow \pi} \sin\left(x - \frac{1}{2}\right) =$

11.  $\lim_{x \rightarrow 2} \frac{\sqrt{(x^4 - 2x^3 + 4x^2 - 8x + 1)(x+2)+5}}{(x+1)\sqrt[3]{x^2+4}} =$

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**Exercise 2.**

Find the following limits:

1.  $\lim_{x \rightarrow 1} \frac{x^2-1}{x-1} =$

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

4.  $\lim_{x \rightarrow 5} \frac{x-5}{x^2-25} =$

5.  $\lim_{x \rightarrow 2} \frac{2-x}{x^2-4} =$

7.  $\lim_{x \rightarrow -3} \frac{x^2+x-6}{x^2-9} =$

8.  $\lim_{x \rightarrow 2} \frac{x^3-4x^2+4x}{x-2} =$

9.  $\lim_{x \rightarrow 0} \frac{x^3-4x^2+4}{x} =$

10.  $\lim_{x \rightarrow 4} \frac{x^2-5x+4}{x^2-2x-8} =$

11.  $\lim_{x \rightarrow 1} \frac{\sqrt{x+1}-1}{x} =$

12.  $\lim_{x \rightarrow 2} \frac{\sqrt{x+4}-2}{x} =$

13.  $\lim_{x \rightarrow 3} \frac{\sqrt{x+3}-\sqrt{3}}{x} =$

14.  $\lim_{x \rightarrow 3} \frac{\sqrt{x+1}-2}{x-3} =$

15.  $\lim_{x \rightarrow 0} \frac{\frac{1}{3+x} - \frac{1}{3}}{x} =$

16.  $\lim_{x \rightarrow 0} \frac{\frac{1}{4+x} - \frac{1}{4}}{x} =$

17.  $\lim_{x \rightarrow 0} \frac{\frac{1}{10+x} - \frac{1}{10}}{x} =$

**Exercise 3.**

Use the Squeeze Theorem to find the  $\lim_{x \rightarrow c} f(x)$

(1) If  $c=0$  and  $1-x^2 \leq f(x) \leq 1+x^2 \quad \forall x \in \mathbb{R}$ .

(2) If  $c=2$  and  $x^2-4 \leq f(x) \leq x^2-x-2 \quad \forall x \in (-\infty, 2]$ .

(3) If  $c=11$  and  $101-(x-11)^2 \leq f(x) \leq 101+(x-11)^2 \quad \forall x \in \mathbb{R}$ .

(4) If  $c=2$  and  $x-(x-2)^8 \leq f(x) \leq x+(x-2)^8 \quad \forall x \in \mathbb{R}$ .