

1.2

Day 2: Finding Limits by Analytic  
Methods Homework

Name \_\_\_\_\_

Date \_\_\_\_\_ Period \_\_\_\_\_

**Problems 1 – 16, Find each of the following limits analytically. Show your algebraic analysis.**

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

2.  $\lim_{t \rightarrow 4} \frac{t-4}{t^2-16}$

3.  $\lim_{x \rightarrow -3} \frac{x^2-5x+6}{2x+6}$

4.  $\lim_{\theta \rightarrow \pi} \sin^2 \theta - 3 \cos \theta$

5.  $\lim_{x \rightarrow 2} \frac{x^3-8}{x-2}$

6.  $\lim_{\theta \rightarrow \frac{\pi}{3}} \frac{\tan \theta}{\theta^2}$

7.  $\lim_{x \rightarrow 0} \frac{\sqrt{x+5} - \sqrt{5}}{x}$

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

$$9. \lim_{x \rightarrow e} \frac{3x}{\ln x}$$

$$10. \lim_{x \rightarrow 2^+} \frac{3x^2 + 7x + 2}{x^2 - 4}$$

$$11. \lim_{x \rightarrow 3} \frac{\frac{1}{x} - \frac{1}{3}}{x - 3}$$

$$12. \lim_{x \rightarrow \frac{3}{2}} \frac{8x^3 - 27}{2x - 3}$$

$$13. \lim_{x \rightarrow \pi^+} \cot x$$

$$14. \lim_{x \rightarrow 0} \cos(x + \sin x)$$

$$15. f(x) = \begin{cases} 3x - 1, & x \leq 1 \\ 3x^2, & x > 1 \end{cases}, \text{ find } \lim_{x \rightarrow 1} f(x)$$

$$16. \lim_{h \rightarrow 0} \frac{(x+h)^2 - x^2}{h}$$

Problems 17 – 32, find the limits, if they exist, for the given piecewise-defined functions.

$$f(x) = \begin{cases} x + 3, & x < 2 \\ x^2 - 1, & 2 \leq x < 4 \\ \sqrt{x + 5}, & x \geq 4 \end{cases}$$

$$g(x) = \begin{cases} 4 - x^2, & x \leq 1 \\ 7, & 1 < x < 3 \\ 2 - x, & x \geq 3 \end{cases}$$

17.  $\lim_{x \rightarrow 2^+} f(x)$

18.  $\lim_{x \rightarrow 2^-} f(x)$

19.  $\lim_{x \rightarrow 2} f(x)$

20.  $f(2)$

21.  $\lim_{x \rightarrow 4^+} f(x)$

22.  $\lim_{x \rightarrow 4^-} f(x)$

23.  $\lim_{x \rightarrow 4} f(x)$

24.  $f(4)$

25.  $\lim_{x \rightarrow 1^-} g(x)$

26.  $\lim_{x \rightarrow 1^+} g(x)$

27.  $\lim_{x \rightarrow 1} g(x)$

28.  $g(1)$

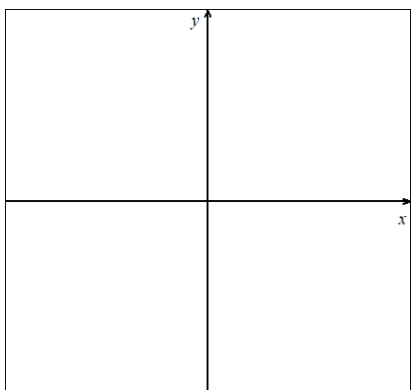
29.  $\lim_{x \rightarrow 3^-} g(x)$

30.  $\lim_{x \rightarrow 3^+} g(x)$

31.  $\lim_{x \rightarrow 3} g(x)$

32.  $g(3)$

33. If  $2 \leq f(x) \leq x^2 + 2$  for all  $x$ ,  
find  $\lim_{x \rightarrow 0} f(x)$ . Sketch a graph to illustrate.



34. If  $\lim_{x \rightarrow c} f(x) = -5$  and  $\lim_{x \rightarrow c} g(x) = 8$ ,  
find  $\lim_{x \rightarrow c} \frac{2f(x)}{g(x) - f(x)}$