

Show all work in the blue book and clearly mark your solutions. Good luck. One problem per page please.

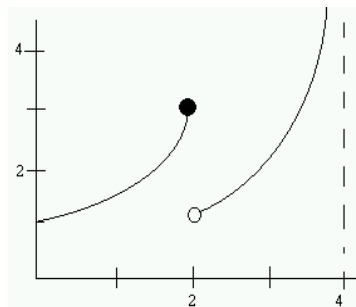
[10] 1. a) give the precise definition of a function.

b) give the precise epsilon-delta definition of a limit  $\lim_{x \rightarrow a} f(x) = L$

[8] 2. Use the epsilon-delta definition from above to prove that  $\lim_{x \rightarrow 3} (10 - 3x) = 1$

[18] 3. In the graph of  $f(x)$  to the right, the line  $x=4$  is a vertical asymptote. Compute:

- a)  $f(2)$     b)  $\lim_{x \rightarrow 2^-} f(x)$     c)  $\lim_{x \rightarrow 2^+} f(x)$     d)  $\lim_{x \rightarrow 4^-} f(x)$   
 e)  $\lim_{x \rightarrow 2} f(x)$  and explain your answer.  
 f) sketch the graph of  $f(x-3) + 2$



[15] 4. Given  $f(x) = \frac{1}{x^2 - 4}$  and  $g(x) = 1 - 2x$ , compute and simplify:

- a)  $g(-5)$     b)  $f(g(x))$     c) the domain of  $f(x)$

For problems 5 and 6, compute the limits. Show all algebraic justification. Explain results. Use  $+\infty$  or  $-\infty$  where appropriate. Include numerical and/or graphical data when appropriate.

[18] 5. a)  $\lim_{x \rightarrow 3} \frac{x^2 + 3x - 18}{9 - x^2}$     b)  $\lim_{x \rightarrow 4} \frac{x - 4}{\sqrt{x} - 2}$     c)  $\lim_{x \rightarrow \frac{5\pi}{4}} \sec x$

[18] 6. a)  $\lim_{x \rightarrow -5} 6 - \sqrt{10 + 2x}$     b)  $\lim_{x \rightarrow 3^+} \frac{3 + x}{6 - 2x}$     c)  $\lim_{x \rightarrow 100} 15$

[16] 7. For  $f(x) = \begin{cases} 3x^2 - 1 & \text{if } x < 2 \\ x + 9 & \text{if } 2 < x \leq 5 \end{cases}$ , compute

- a)  $f(2)$     b)  $\lim_{x \rightarrow 2} f(x)$  (show all work and state the reason for your conclusion)  
 c)  $f(5)$     d)  $\lim_{x \rightarrow 5} f(x)$  (again, show work and state reasons)