Evaluate each limit.

1. $\lim\limits_{x\to 3} \dfrac{x^2-x-6}{x-3}$

2. $\lim\limits_{x\to\infty} \dfrac{5x^3-3x^2}{2-x}$

3. $\lim\limits_{x\to 5^-} \dfrac{x+2}{x-5}$

4. $\lim\limits_{x\to\infty} \dfrac{\sqrt{4x^2+5}}{x^2}$

5. $\lim\limits_{x\to 2} \dfrac{x-2}{\frac{1}{x}-\frac{1}{2}}$

6. $\lim\limits_{x\to-\infty} \dfrac{6x+x^2-5x^4}{3x^2-x+8}$

7. $\lim\limits_{h\to 0} \dfrac{\sqrt{4+h}-2}{h}$

8. $\lim\limits_{x\to 3} \dfrac{x-3}{\sqrt{x+1}-2}$

9. $\lim\limits_{x\to 4^-} \dfrac{|x-4|}{x-4}$

#10 – 17. The graph of $y = f(x)$ is given below.

Evaluate each of the following:

10. $\lim\limits_{x\to-2} f(x) =$

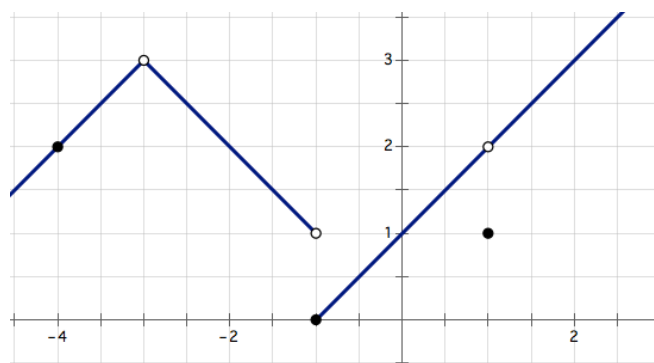11. $\lim\limits_{x\to 2} f(x) =$

12. $\lim\limits_{x\to-1^-} f(x) =$

14. $\lim\limits_{x\to-1^+} f(x) =$

15. $\lim\limits_{x\to-1} f(x) =$

16. $\lim\limits_{x\to 1} f(x) =$

17. Identify all points of discontinuity on the graph above.
State what type of discontinuity at each location and justify why it is discontinuous.

18. State the 3 conditions for continuity at $x = a$.

19. Find the value of x as x approaches 2 so that the limit exists. $f(x) = \begin{cases} a-x^2, & x<2 \\ x^2+5x-3, & x\ge 2 \end{cases}$

20. Find the points of discontinuity of the function $y = \dfrac{x^2-2x-3}{x^2-7x+12}$. For each discontinuity, identify the type of discontinuity (removable, jump, infinite).

21. Find all asymptotes (both vertical and horizontal) for $f(x) = \dfrac{x-2}{x^2-4}$

22. If $\lim\limits_{x \to c} f(x) = -\frac{1}{2}$ and $\lim\limits_{x \to c} g(x) = \frac{2}{3}$, find $\lim\limits_{x \to c} [f(x)g(x)]$.

(a) $\frac{1}{6}$ (b) $-\frac{1}{3}$ (c) 1

(d) The limit does not exist. (e) None of these

23. Find the limit: $\lim\limits_{x \to 0} \dfrac{\dfrac{1}{x+3} - \dfrac{1}{3}}{x}$.

(a) $-\dfrac{1}{9}$ (b) 0 (c) $\dfrac{1}{9}$

(d) The limit does not exist. (e) None of these

24. $f(x) = x^2 - 2x + 3$
   a. Find the average rate of change for this function on the interval [-1, 3].
   b. Find the instantaneous rate of change for this function at $x = 2$.

25. For the function $f(x) = x^2 - 4$ at the point (4, 12), find
   (a) the slope of the curve

   (b) the equation of the tangent line

   (c) the equation of the normal line.

   (d) Write the equation of the secant line to this curve over the interval $[-3, 1]$.

26.

x	1.97	1.98	1.99	2	2.01	2.02	2.03
f(x)	3.762	3.787	3.799	3.8	3.801	3.805	3.810

   a. Find $\lim\limits_{x \to 2} f(x)$
   b. Find the average rate of change from $x = 2$ to $x = 2.03$.