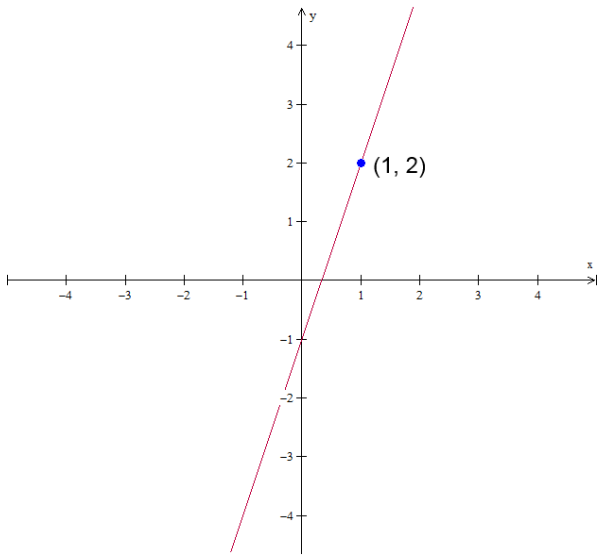
# Limits

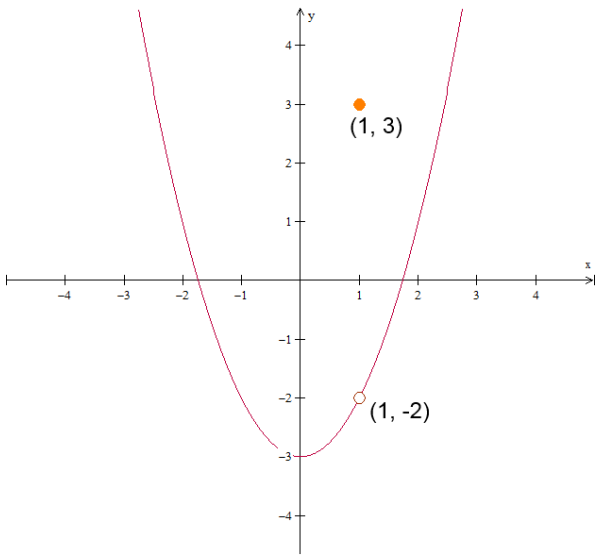
In problems 1-2, find the limit using the graph of f(x)

1.




$\lim_{x\to 1} f(x)$

2.




$\lim_{x\to 1} f(x)$

In problems 3-6, find the limit by filling out the table

3. $\lim_{x\to 3}\left(x^2+4x\right)$

| x | 2.9 | 2.99 | 2.999 | 3 | 3.001 | 3.01 | 3.1 |
|---|---|---|---|---|---|---|---|
| f(x) | | | | | | | |

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

| x | 0.9 | 0.99 | 0.999 | 1 | 1.001 | 1.01 | 1.1 |
|---|---|---|---|---|---|---|---|
| f(x) | | | | | | | |

5. $\lim_{x\to 0}\left(\frac{\sqrt{x+4}-2}{x}\right)$

| x | -0.1 | -0.01 | -0.001 | 0 | 0.001 | 0.01 | 0.1 |
|---|---|---|---|---|---|---|---|
| f(x) | | | | | | | |

# Limits

6. $\lim_{x\to -3}\left(\dfrac{\frac{1}{3}-\frac{1}{x+3}}{x}\right)$

| x | -3.1 | -3.01 | -3.001 | -3 | -2.999 | -2.99 | -2.9 |
|---|---|---|---|---|---|---|---|
| f(x) | | | | | | | |

In problems 7-16, find the limit using direct substitution

| | |
|---|---|
| 7. $\lim_{x\to 2} 8$ | 8. $\lim_{x\to -5}\left(x^2-3x\right)$ |
| 9. $\lim_{x\to 4}\dfrac{\sqrt{x}+3}{10}$ | 10. $\lim_{x\to 3}\sqrt[3]{x^2+4x-13}$ |
| 11. $\lim_{x\to -1}\left(x^2+8x-2\right)$ | 12. $\lim_{x\to 2}\dfrac{x+3}{x-7}$ |
| 13. $\lim_{x\to 1}\left(x^4-3x+5\right)$ | 14. $\lim_{x\to 7}\lvert x-10\rvert$ |
| 15. $\lim_{x\to 3}\left(x^2-\dfrac{1}{x}\right)$ | 16. $\lim_{x\to -2}\dfrac{\frac{1}{x-4}+3}{\frac{1}{x+5}}$ |

In problems 17-25, find each limit using algebraic techniques

| | |
|---|---|
| 17. $\lim_{x\to 8}\dfrac{x-8}{x^2-64}$ | 18. $\lim_{x\to 2}\dfrac{x^2-5x+6}{x^2+2x-8}$ |
| 19. $\lim_{x\to -5}\dfrac{2x^2+9x-5}{x^2+x-20}$ | 20. $\lim_{\Delta x\to 0}\dfrac{3(x+\Delta x)+4-(3x+4)}{\Delta x}$ |
| 21. $\lim_{\Delta x\to 0}\dfrac{(x+\Delta x)^2+7(x+\Delta x)-(x^2+7x)}{\Delta x}$ | 22. $\lim_{x\to -6}\dfrac{\sqrt{x+7}-1}{x+6}$ |
| 23. $\lim_{x\to 0}\dfrac{\sqrt{x+2}-\sqrt{2}}{x}$ | 24. $\lim_{x\to 6} f(x)\quad where\quad f(x)=\begin{cases}x^2+3, x\le 6\\ 7x-1, x>6\end{cases}$ |

| | |
|---|---|
| 25. $\lim_{x\to 2} f(x)$ *where* $f(x)=\begin{cases}3x+5, x\le 2\\ 9x-7, x>2\end{cases}$ | |

In problems 26-27, use the graph to find the limit

| | |
|---|---|
| 26. $\lim_{x\to -3}\dfrac{1}{x+3}$ | 27. $\lim_{x\to 1}\dfrac{2}{x^2-3x+2}$ |

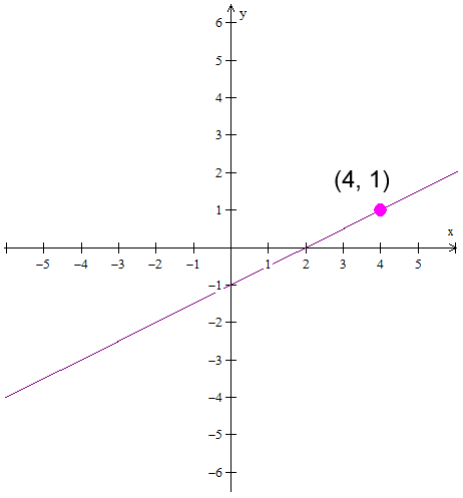
In problems 28-30, use the graph to find the one-sided limit

| | |
|---|---|
| 28. $\lim_{x\to -1^-}\dfrac{\lvert x+1\rvert}{x+1}$ and $\lim_{x\to -1^+}\dfrac{\lvert x+1\rvert}{x+1}$ | 29. $\lim_{x\to 2^-}\dfrac{1}{x-2}$ |
| 30. $\lim_{x\to -4^+}\dfrac{1}{x^2+5x+4}$ | |

In problems 31-32, use the graph to find the limit

$(a)\lim_{x\to c^+} f(x)\quad (b)\lim_{x\to c^-} f(x)\quad (c)\lim_{x\to c} f(x)$

31. c = 4



32. c = 2