

SLOPE

1. A growing company finds it needs to hire new people quickly. At present it is hiring 8 new people every 5 days.
 - a. If the company now has 50 employees, write a function for the number of employees in x days.
 - b. How many employees will they have on day 20?

2. A boy starts 20 kilometers from school and runs towards school at a rate of 4 kilometers per hour.
 - a. Write a function for his distance from school in terms of the number of hours he has been running.
 - b. Find the time when he gets to school.

3. Find the slope of the line parallel to $3x - 2y = 8$.

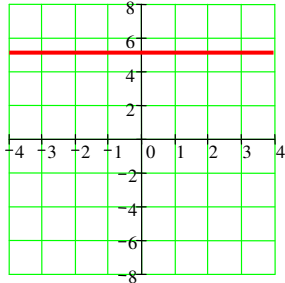
4. State slope of line perpendicular to the same line.

5. Write the equation of the line passing through: $(2, 5)$ and $(-3, -7)$ and then graph it.

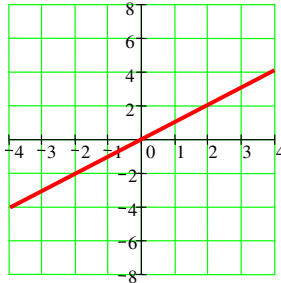
6. In 1972 a teacher earned \$8000 in yearly salary. In 1990 she earned \$50,000.
- Write a function of the salary earned in year x where $x = 0$ in 1970.
 - Find her salary in the year 2005.
 - By how much does her salary increase each year?

Toolbox Functions

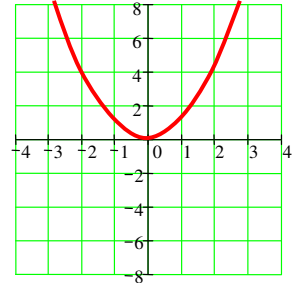
7. $y = c$



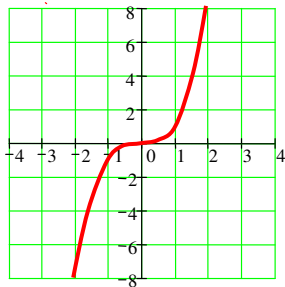
8. $y = x$



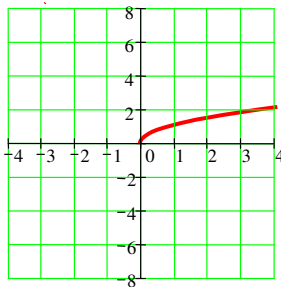
9. $y = x^2$



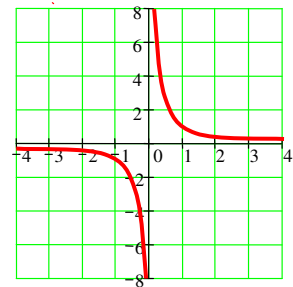
10. $y = x^3$



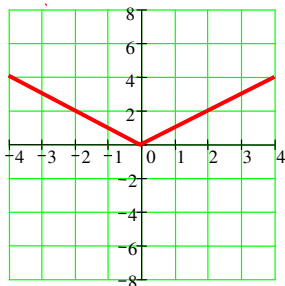
11. $y = \sqrt{x}$



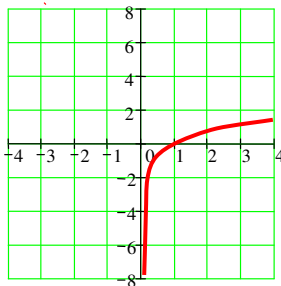
12. $y = \frac{1}{x}$



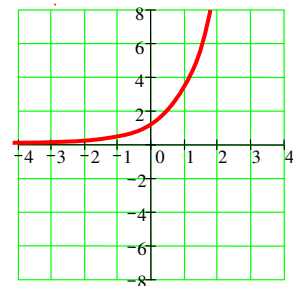
13. $y = |x|$



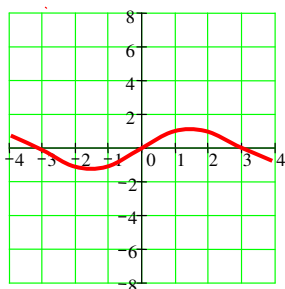
14. $y = \ln x$



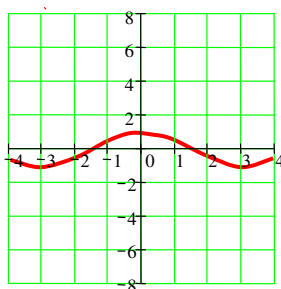
15. $y = e^x$



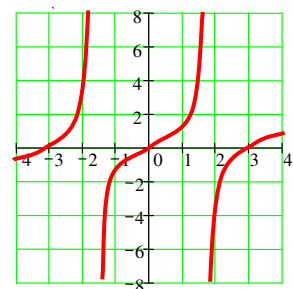
16. $y = \sin x$



17. $y = \cos x$

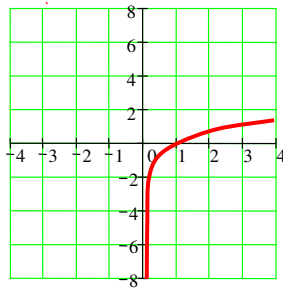


18. $y = \tan x$

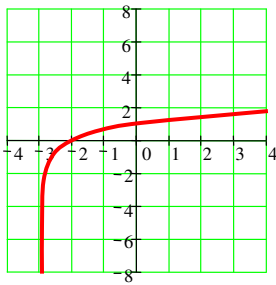


GRAPHING TRANSFORMATIONS

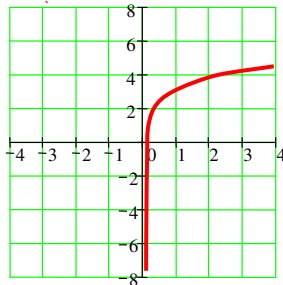
Example function: $f(x) = \ln x$



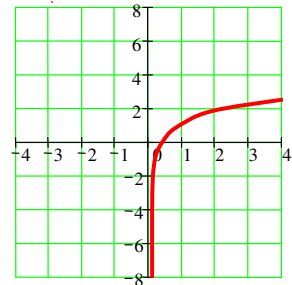
19. $y = f(x+3)$



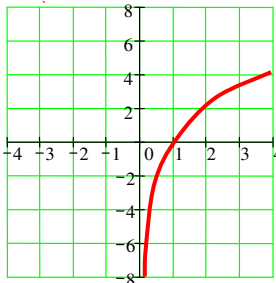
20. $y = f(x)+3$



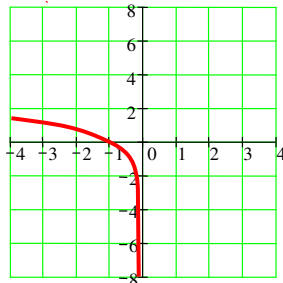
21. $y = f(3x)$



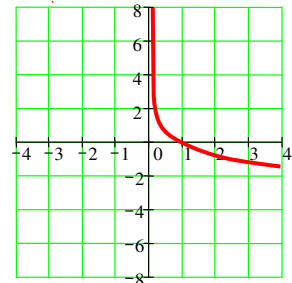
22. $y = 3f(x)$



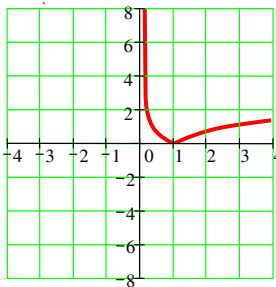
23. $y = f(-x)$



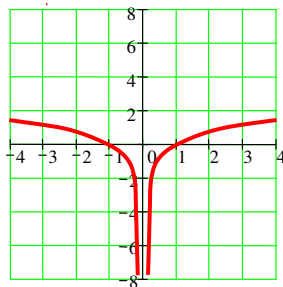
24. $y = -f(x)$



25. $y = |f(x)|$



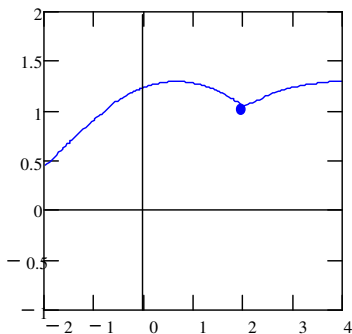
26. $y = f(|x|)$



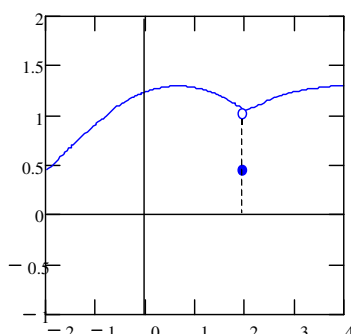
LIMITS

Def. Limit: $\lim_{x \rightarrow c} f(x) = L$ means that $f(x)$ becomes increasingly close to L as x gets closer to c .

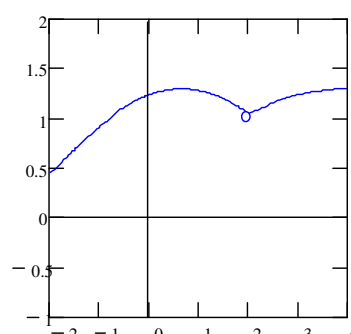
1. Examples of functions that HAVE a limit at $x = 2$:



$$\lim_{x \rightarrow 2} f(x) = 1$$

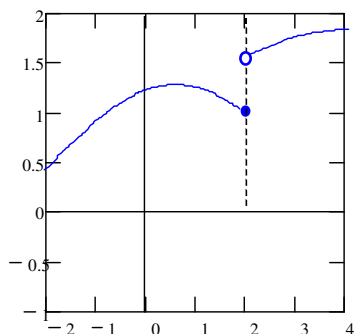


$$\lim_{x \rightarrow 2} f(x) = 1$$



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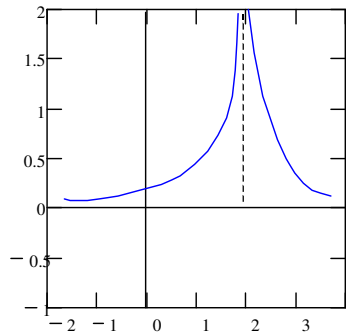
2. Examples of functions that do NOT HAVE a limit at $x = 2$:



No limit since left-hand and right-hand limits are not equal.

$$\lim_{x \rightarrow 2^-} f(x) = 1$$

$$\lim_{x \rightarrow 2^+} f(x) = 1.5$$



No limit since left-hand and right-hand limits do not exist.

$$\lim_{x \rightarrow 2^-} f(x) = \infty$$

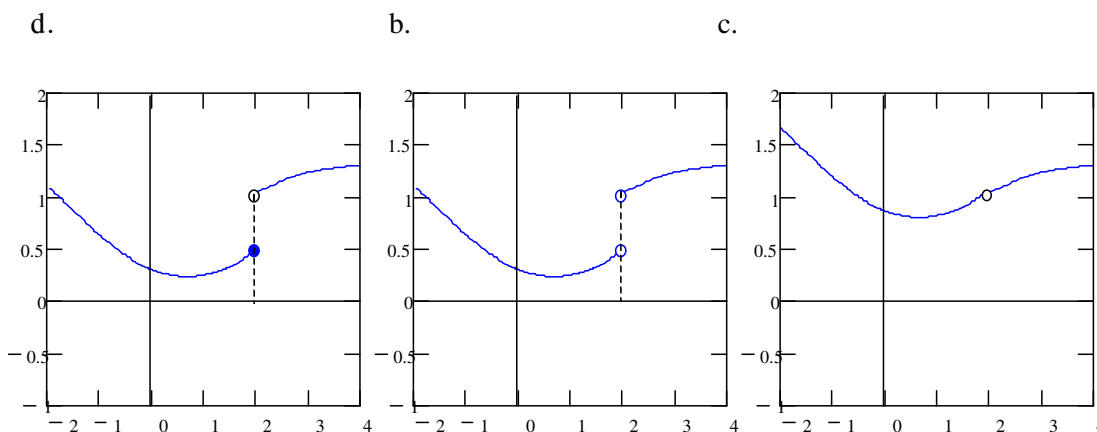
$$\lim_{x \rightarrow 2^+} f(x) = \infty$$

LEFT-HAND AND RIGHT-HAND LIMITS

Def. **Right Hand Limit:** $\lim_{x \rightarrow c^+} f(x) = L$ means that $f(x)$ becomes increasingly close to L as x gets closer to c from the right.

Def. **Left Hand Limit:** $\lim_{x \rightarrow c^-} f(x) = L$ means that $f(x)$ becomes increasingly close to L as x gets closer to c from the left.

3. State the left-hand and right-hand limit of each.



Thm. **❖Limit Existence:** If $f(x)$ is a function and c and L are real numbers, then $\lim_{x \rightarrow c} f(x) = L$ if and only if $\lim_{x \rightarrow c^-} f(x) = L$ and $\lim_{x \rightarrow c^+} f(x) = L$.

4. Which of the above three functions has a limit at $x = 2$?