

Section 2.3: 1-29 odd, 41-52 all

1. $y = \frac{1}{(x+2)^2}$

$(x+2)^2 = 0$
 $x+2 = 0$

$x = -2$, Infinite Disc.

3. $y = \frac{1}{x^2+1}$

$x^2+1 = 0$
 $x^2 = -1$

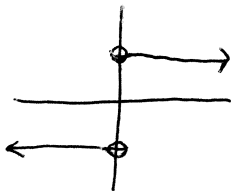
No disc. in \mathbb{R}

5. $y = \sqrt{2x+3}$

$2x+3 < 0$

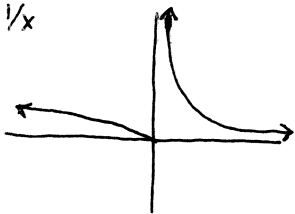
$x < -3/2$, not in domain

7. $y = \frac{|x|}{x}$



$x = 0$, Jump disc.

9. $y = e^{1/x}$



$x = 0$, Infinite/Jump disc.

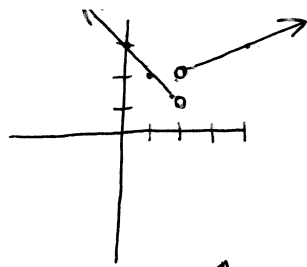
- 11. a) Yes
- b) Yes
- c) Yes
- d) Yes

- 13. a) No (no point)
- b) No

15. $f(z) = 0$

17. No, because there is a jump discontinuity, not just a point/removable discontinuity. $\lim_{x \rightarrow 0^-} f(x) \neq \lim_{x \rightarrow 0^+} f(x)$.

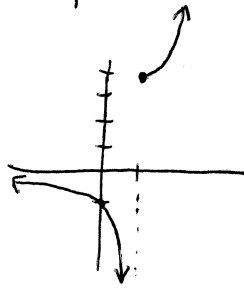
$$19. f(x) = \begin{cases} -x+3, & x < 2 \\ \frac{1}{2}x+1, & x > 2 \end{cases}$$



a) $x=2$

b) Jump, so not removable

$$21. f(x) = \begin{cases} \frac{1}{x-1}, & x < 1 \\ x^3 - 2x + 5, & x \geq 1 \end{cases}$$



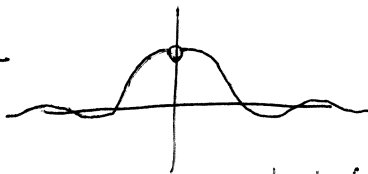
a) $x=1$

b) Infinite/Jump, so not removable

23. $x=0$ is Point/Removable, assign $f(0)=0$ to extended function
 $x=1$ is Jump, so not removable
 $x < -1$ and $x > 2$ are not in the domain

$$25. f(x) = \frac{x^2-9}{x+3} = \frac{(x+3)(x-3)}{x+3} = \boxed{x-3}$$

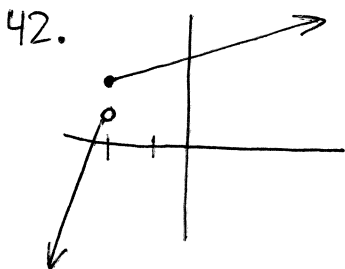
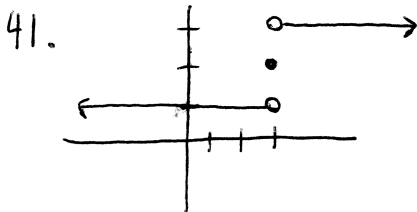
$$27. f(x) = \frac{\sin x}{x}$$



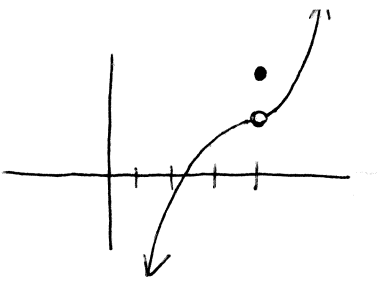
Fill point at $(0,1)$

$$f(x) = \begin{cases} \frac{\sin x}{x}, & x \neq 0 \\ 1, & x = 0 \end{cases}$$

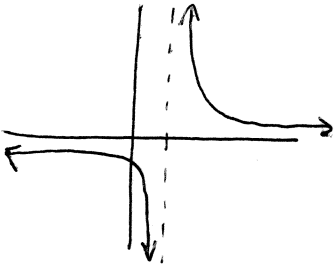
$$29. f(x) = \frac{x-4}{\sqrt{x}-2} = \frac{(\sqrt{x}+2)(\sqrt{x}-2)}{\sqrt{x}-2} = \boxed{\sqrt{x}+2}$$



43.



44.



45. $x^4 - 1 = x$

Find intersections on graph: $x = -0.724$ and $x = 1.221$

46. $x^3 + 2 = x$ at $x = -1.521$

47. $3^2 - 1 = 8$

$2a(3) = 8$

$a = \frac{8}{6} = \frac{4}{3}$

48. $2(2) + 3 = 7$

$a(2) + 1 = 7$

$2a = 6$

$a = 3$

49. $4 - (-1)^2 = 3$

$a(-1)^2 - 1 = 3$

$a = 4$

50. $1^3 = 1$

$1^2 + 1 + a = 1$

$a = -1$

51. If $e^{-x} = x$, then $x - e^{-x} = 0$ for some value of x .

$x - e^{-x} = x - \frac{1}{e^x}$

$0 - \frac{1}{e^0} = 0 - \frac{1}{1} = -1 \rightarrow (0, -1)$

$1 - \frac{1}{e^1} = 1 - \frac{1}{e} = 0.632 \rightarrow (1, 0.632)$

By the Intermediate Value Theorem (IVT), there is some x value (c)in $(0, 1)$ so that $y = 0$, and therefore

$x - e^{-x} = 0$ and $x = e^{-x}$.

52. During 1st year: $0 \leq t < 1$ salary is $36,500(1.035)^0 = 36,500$

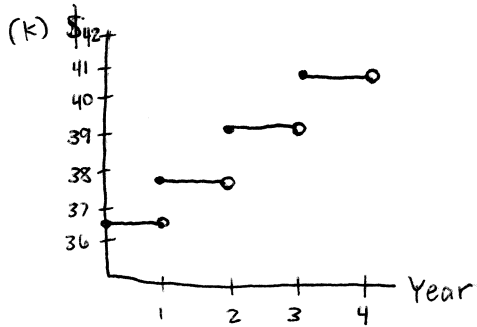
During 2nd year: $1 \leq t < 2$ salary is $36,500(1.035)^1 = 37,777.50$

During 3rd year: $2 \leq t < 3$ salary is $36,500(1.035)^2 = 39,099.71$

During 4th year: $3 \leq t < 4$ salary is $36,500(1.035)^3 = 40,468.20$

During 5th year: $4 \leq t < 5$ salary is $36,500(1.035)^4 = 41,884.59$

In general, $y = 36,500(1.035)^{\text{int}(t)}$



Continuous except for $t=1, 2, 3, 4, \text{etc.}$ because at the end of each year she gets her raise and her salary jumps up.