

Section §1.4.

2 page 45

$$x + y^2 = 4$$

$$y^2 = 4 - x$$

$$y = \pm \sqrt{4 - x} \text{ does not define$$

y as a function of x.

3 page 45

$$\frac{1}{2}x - 6y = -3$$

$$-6y = -3 - \frac{1}{2}x \quad \div -6$$

$$y = \frac{-3}{-6} - \frac{\frac{1}{2}x}{-6}$$

$$y = \frac{1}{2} + \frac{1}{12}x \text{ defines$$

y as a function of x.

8 page 45

$$x^2y - x^2 + 4y = 0$$

$$y(x^2 + 4) - x^2 = 0$$

$$y(x^2 + 4) = x^2$$

$$y = \frac{x^2}{x^2 + 4} \text{ defines y as a function$$

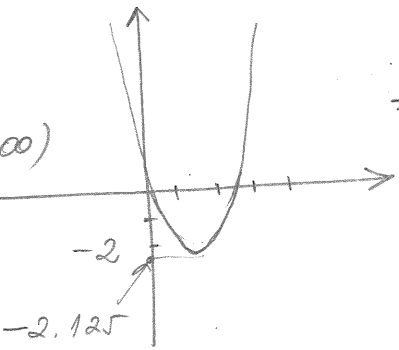
of x.

9 page 45

Domain: \mathbb{R}

Range: $[-2.125, \infty)$

$$f(x) = 2x^2 - 5x + 1$$



$$f\left(\frac{5}{4}\right) =$$

$$= 2 \cdot \frac{25}{16} - \frac{25}{4} + 1$$

$$= 1 - \frac{25}{8} = -\frac{21}{8} = \boxed{-2.125}$$

18 page 45

Domain: $\left[\frac{3}{2}, \infty\right)$

Range: $[0, \infty)$

$$2x - 3 \geq 0$$

$$2x \geq 3$$

$$x \geq \frac{3}{2}$$

20 page 45

Domain: \mathbb{R}

Range: $[0, \infty)$

23 page 45

$$(a) g(2) = \frac{1}{2}; (b) g\left(\frac{1}{4}\right) = \frac{1}{\frac{1}{4}} = 4$$

$$(c) g(x+4) = \frac{1}{x+4}; (d)$$

$$g(x+\Delta x) - g(x) = \frac{1}{x+\Delta x} - \frac{1}{x}$$

$$= \frac{x - (x + \Delta x)}{x(x + \Delta x)} = \frac{x - x - \Delta x}{x(x + \Delta x)}$$

$$= -\frac{\Delta x}{x(x + \Delta x)}$$

24 page 45

$$(a) f(2) = |2| + 4 = 6;$$

$$(b) f(-2) = |-2| + 4 = 6;$$

$$(c) f(x+2) = |x+2| + 4;$$

$$(d) f(x+\Delta x) - f(x) = [|x+\Delta x| + 4] - [|x| + 4]$$

$$= |x+\Delta x| - |x|.$$

26 page 45

$$h(2+\Delta x) = (2+\Delta x)^2 - (2+\Delta x) + 1$$

$$= 4 + 4\Delta x + (\Delta x)^2 - 2 - \Delta x + 1$$

$$= 3 + 3\Delta x + (\Delta x)^2$$

$$h(2) = 4 - 2 + 1 = 3$$

$$\frac{h(2+\Delta x) - h(2)}{\Delta x} =$$

$$= \frac{3 + 3\Delta x + (\Delta x)^2 - 3}{\Delta x}$$

$$= \frac{\Delta x(3 + \Delta x)}{\Delta x}$$

$$= \boxed{3 + \Delta x}$$

#30 page 46

$$f(x+\Delta x) = \frac{1}{x+\Delta x+4}$$

$$f(x) = \frac{1}{x+4}$$

$$\frac{f(x+\Delta x) - f(x)}{\Delta x} = \frac{\frac{1}{x+\Delta x+4} - \frac{1}{x+4}}{\Delta x}$$

$$= \frac{\frac{(x+4) - (x+\Delta x+4)}{(x+4)(x+\Delta x+4)}}{\Delta x}$$

$$= \frac{-\Delta x}{(x+4)(x+\Delta x+4) \Delta x}$$

$$= \boxed{\frac{1}{(x+4)(x+\Delta x+4)}}$$

#32 page 46

y is a function of x.

#34 page 46

y is not a function of x.

#38 page 46

(a) $f(x) + g(x) = x^2 + 5 + \sqrt{1-x}$

(b) $f(x) \cdot g(x) = (x^2 + 5) \cdot \sqrt{1-x}$

(c) $\frac{f(x)}{g(x)} = \frac{x^2 + 5}{\sqrt{1-x}}$

(d) $f(g(x)) = g(x)^2 + 5$

$$= (\sqrt{1-x})^2 + 5$$

$$= 1 - x + 5$$

$$= 6 - x$$

(e) $g(f(x)) = \sqrt{1 - f(x)^2}$

$$= \sqrt{1 - (x^2 + 5)^2}$$

$x^2 + 5 \geq 5 \Rightarrow (x^2 + 5)^2 \geq 25 \Rightarrow$

$1 - (x^2 + 5)^2 \leq -24 \Rightarrow$

g(f(x)) is not defined.

#42 page 46

(a) $f(g(2)) = \frac{1}{g(2)} = \frac{1}{4-1} = \boxed{\frac{1}{3}}$

(b) $g(f(2)) = f(2)^2 - 1 = \left(\frac{1}{2}\right)^2 - 1 =$

$$= \frac{1}{4} - 1 = \boxed{\frac{3}{4}}$$

(c) $f(g(\frac{1}{\sqrt{2}})) = \frac{1}{\left(\frac{1}{\sqrt{2}}\right)^2 - 1} =$

$$= \frac{1}{\frac{1}{2} - 1} = \frac{1}{-\frac{1}{2}} = \boxed{-2}$$

(d) $g(f(\frac{1}{\sqrt{2}})) = (\frac{1}{\frac{1}{\sqrt{2}}})^2 - 1$
 $= (\sqrt{2})^2 - 1 = 2 - 1 = 1$

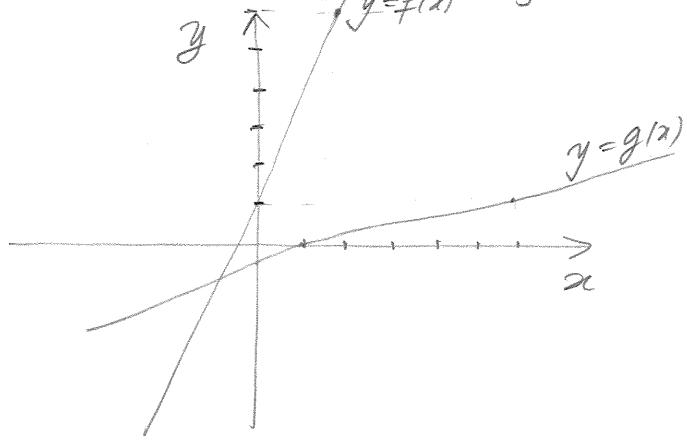
(e) $f(g(x)) = \frac{1}{x^2 - 1}$

(f) $g(f(x)) = \frac{1}{x^2} - 1$

#47 page 46

$f(g(x)) = 5 \cdot \frac{x-1}{5} + 1 = x - 1 + 1 = x$

$g(f(x)) = \frac{(5x+1)-1}{5} = \frac{5x}{5} = x$



#56 page 46

$f(x) = \sqrt{x^2 - 4}, x \geq 2$

$\sqrt{x^2 - 4} = y$ Remark $y \geq 0$

Solve for x

$x^2 - 4 = y^2$

$x^2 = y^2 + 4$

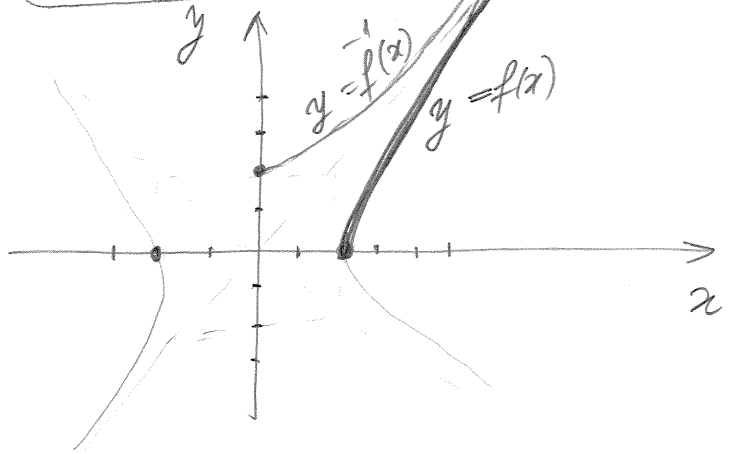
$x = \pm \sqrt{y^2 + 4}$

Since $x \geq 2$, choose +

$x = \sqrt{y^2 + 4}, y \geq 2$

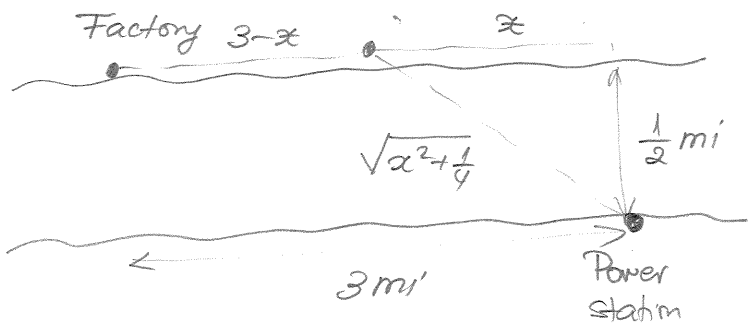
Interchange x with y
 $y = \sqrt{x^2 + 4}, x \geq 0$

$f^{-1}(x) = \sqrt{x^2 + 4}, x \geq 0$



$x^2 - y^2 = 4$ is the equation of a hyperbola

#42 page 47



$C(x) = (3-x) \cdot \frac{10}{5280} + \sqrt{x^2 + \frac{1}{4}} \cdot \frac{15}{5280}$

$1 \text{ mi} = 5280 \text{ ft.}$

$C(x) = \frac{3-x}{528} + \sqrt{x^2 + \frac{1}{4}} \cdot \frac{1}{352}$



Section 1.5.

#6 page 58

x	-0.1	-0.01	-0.001	0	0.001	0.01	0.1
$f(x)$	0.3580	0.3539	0.3535	?	0.3535	0.3531	0.3492

$$\lim_{x \rightarrow 0} \frac{\sqrt{x+2} - \sqrt{2}}{x} \approx 0.3535$$

#12 page 59 $\lim_{x \rightarrow -2} h(x) = -5$

$$\lim_{x \rightarrow 0} h(x) = -3$$

#14 page 59

(a) $\lim_{x \rightarrow c} (f(x) + g(x)) = \frac{3}{2} + \frac{1}{2} = \frac{4}{2} = 2$

(b) $\lim_{x \rightarrow c} f(x) - g(x) = \frac{3}{2} - \frac{1}{2} = 1$

(c) $\lim_{x \rightarrow c} \frac{f(x)}{g(x)} = \frac{\frac{3}{2}}{\frac{1}{2}} = \frac{3}{2} \cdot 2 = 3$

#16 page 59

(a) $\lim_{x \rightarrow c} \sqrt{f(x)} = \sqrt{9} = 3$

(b) $\lim_{x \rightarrow c} [3f(x)] = 3 \cdot 9 = 18$

(c) $\lim_{x \rightarrow c} [f(x)]^2 = 9^2 = 81$

#18 page 59

(a) $\lim_{x \rightarrow 3^+} f(x) = 0$; (c) $\lim_{x \rightarrow 3} f(x) = 0$.

(b) $\lim_{x \rightarrow 3^-} f(x) = 0$;

#22 page 59

(a) $\lim_{x \rightarrow -1^+} f(x) = 0$; (c) $\lim_{x \rightarrow -1} f(x) = \text{DNE}$

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

#28 page 59

$$\lim_{x \rightarrow 2} (-x^2 + x - 2) = -2^2 + 2 - 2 = -4$$

#32 page 59

$$\lim_{x \rightarrow -2} \frac{3x-1}{2-x} = \frac{3(-2)-1}{2-(-2)} =$$

$$= \frac{-6-1}{2+2} = \frac{-7}{4}$$

#36 page 59

$$\lim_{x \rightarrow 3} \frac{\sqrt{x+1}}{x-4} = \frac{\sqrt{3+1}}{3-4} = \frac{2}{-1}$$

$$= -2$$

#40 page 59

$$\lim_{x \rightarrow 2} \frac{\frac{1}{x+2} - \frac{1}{2}}{2} = \frac{\frac{1}{4} - \frac{1}{2}}{2}$$

$$= \frac{-\frac{1}{4}}{2} = -\frac{1}{4 \cdot 2} = -\frac{1}{8}$$

#42 page 59

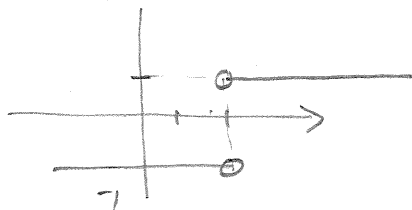
$$\lim_{x \rightarrow -1} \frac{2x^2 - x - 3}{x+1} = \left(\frac{2+1-3}{0} = \frac{0}{0} \right)$$

$$= \lim_{x \rightarrow -1} \frac{(x+1)(2x-3)}{(x+1)}$$

$$= 2(-1) - 3 = -5$$

#50 page 60 $\lim_{x \rightarrow 2} \frac{|x-2|}{x-2} = \text{DNE}$

$$\frac{|x-2|}{x-2} = \begin{cases} \frac{x-2}{x-2}, & x > 2 \\ -\frac{(x-2)}{x-2}, & x < 2 \end{cases} = \begin{cases} 1, & x > 2 \\ -1, & x < 2 \end{cases}$$



#70 page 60

$$A = 1000 \left(1 + \frac{r}{4}\right)^{40}$$

$$\lim_{r \rightarrow 6} A = 1000 \left(1 + \frac{0.06}{4}\right)^{40} = 1814.018409$$

#54 page 60

$$\lim_{\Delta x \rightarrow 0} \frac{4(x + \Delta x) - 5 - (4x - 5)}{\Delta x}$$

$$= \lim_{\Delta x \rightarrow 0} \frac{4x + 4\Delta x - 5 - 4x + 5}{\Delta x}$$

$$= \lim_{\Delta x \rightarrow 0} \frac{4\Delta x}{\Delta x} = 4$$

#56 page 60

$$\lim_{\Delta x \rightarrow 0} \frac{\sqrt{x + \Delta x} - \sqrt{x}}{\Delta x}$$

$$= \lim_{\Delta x \rightarrow 0} \frac{\sqrt{x + \Delta x} - \sqrt{x}}{\Delta x} \cdot \frac{\sqrt{x + \Delta x} + \sqrt{x}}{\sqrt{x + \Delta x} + \sqrt{x}}$$

$$= \lim_{\Delta x \rightarrow 0} \frac{x + \Delta x - x}{\Delta x (\sqrt{x + \Delta x} + \sqrt{x})}$$

$$= \lim_{\Delta x \rightarrow 0} \frac{\Delta x}{\Delta x (\sqrt{x + \Delta x} + \sqrt{x})}$$

$$= \lim_{\Delta x \rightarrow 0} \frac{1}{\sqrt{x + \Delta x} + \sqrt{x}} = \frac{1}{2\sqrt{x}}$$

Section 1.6.

2 page 69 $f(x)$ is continuous on \mathbb{R}
because it is a polynomial.

8 page 69 $f(x) = \frac{x+4}{x^2-6x+5}$

$$= \frac{x+4}{(x-1)(x-5)}$$

Since $x=1$ and $x=5$ are not in the domain of f , the function f is not continuous on the entire line (\mathbb{R}) .

12 page 69

$(-\infty, -2)$, $(-2, 2)$ and $(2, \infty)$

13 page 69

$(-\infty, -1)$ and $(1, \infty)$

16 page 69 \mathbb{R}

17 page 69

$$x^2 - 1 \neq 0 \Leftrightarrow x^2 \neq 1 \Leftrightarrow x \neq \pm 1$$

Hence f is continuous on
 $(-\infty, -1)$, $(-1, 1)$ and $(1, \infty)$

20 page 69 \mathbb{R}

22 page 69

$$x^2 + x - 2 = (x-1)(x+2)$$

Hence f is continuous on
 $(-\infty, -2)$, $(-2, 1)$ and $(1, \infty)$.

26 page 70

$$\lim_{x \rightarrow 2^-} f(x) = \lim_{x \rightarrow 2^-} 3+x = 5;$$

$$\lim_{x \rightarrow 2^+} f(x) = \lim_{x \rightarrow 2^+} x^2 + 1 = 5;$$

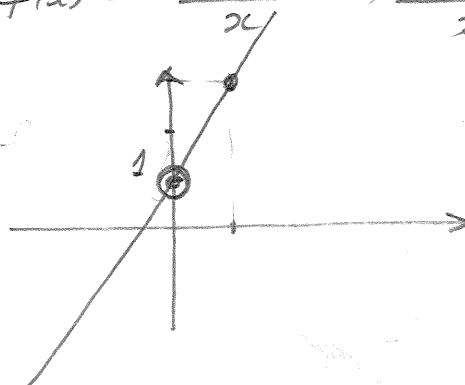
Hence $f(2) = 5$
Hence f is continuous on \mathbb{R} .

37 page 70

Discontinuity at $x=2$. Not removable.

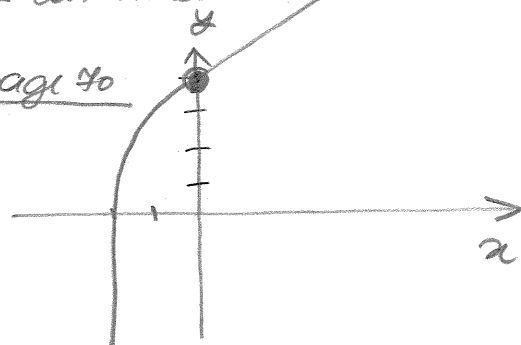
40 page 70

$$f(x) = \frac{2x^2+x}{x} = \frac{x(2x+1)}{x} = 2x+1 \quad x \neq 0$$



f is continuous on $(-\infty, 0)$ and $(0, \infty)$.

44 page 70



f is continuous on \mathbb{R} .

59 page 70

$$A = 7500 (1.015)^{\lfloor 4t \rfloor}, \quad t \geq 0$$

(a)

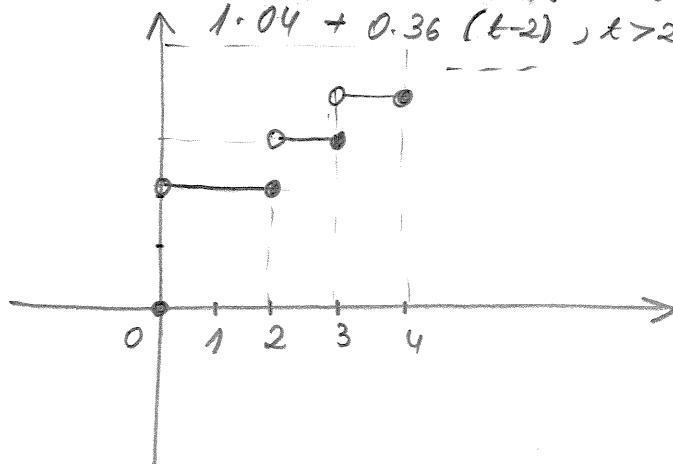


$$(e) A(7) = 7500 (1.015)^{\lceil 28 \rceil} =$$

$$\$ 11379.16635$$

#63 page 71

$$(a) C(t) = \begin{cases} 1.04 & 0 \leq t \leq 2 \\ 1.04 + 0.36 \lceil t \rceil, & t > 2, t \text{ not an integer} \\ 1.04 + 0.36(t-2), & t > 2, t \text{ is an integer} \end{cases}$$



$$(e) C(0) = 1.04 + 7 \cdot 0.36$$

$$= \$ 3.56$$