Answers, hints and comments

Exercise 1.1

1 (a) $p = 7$ (b) $q = 5$ (c) $r = 10$

2 (a) $x = 1$ (b) $x = 5$ (c) $x = -34$

3 $\cos C = \dfrac{a^2 + b^2 - c^2}{2ab}$

4 (a) $2(x + 5)$ (b) $4(x + 2)$ (c) $3(x + 7)$ (d) $2(x - 3)$

5 (a) $x = -4$ (b) $x = 9$ (c) $x = \frac{1}{18}$

6 (a) $x = \dfrac{2b - ad}{ac - b}$ (or $\dfrac{ad - 2b}{b - ac}$) (b) $x = \dfrac{d(4 - b)}{bc - 2}$ (or $x = \dfrac{d(b - 4)}{2 - bc}$)

Exercise 1.2

1 (a) $\dfrac{20}{7}$ (b) $\dfrac{5}{4}$ (c) $\dfrac{14}{9}$ (d) $\dfrac{4}{5}$

(e) $\dfrac{2}{11}$ (f) $\dfrac{8}{33}$ (g) $\dfrac{2}{7}$ (h) $\dfrac{6}{35}$

(i) $\dfrac{3x^2}{y}$ (j) $\dfrac{3x}{y}$ (k) $\dfrac{5x^2}{4y}$ (l) $\dfrac{5x^2}{6y^2}$

(m) $\dfrac{15x^4}{2y}$ (n) $\dfrac{3y^4}{2xz}$ (o) $\dfrac{3xy^2}{5z}$ (p) $\dfrac{5a^2}{12x^3yz^2}$

2 (a) $x = \sqrt{\dfrac{A}{2\pi}}$ (b) $x = \sqrt[3]{\dfrac{3V}{4\pi}}$ (c) $x = \dfrac{u + v}{2t}$ (d) $x = \sqrt{\dfrac{3W}{2\pi h}}$

3 (a) $\dfrac{1 + x}{1 + 3x}$ (b) $\dfrac{2 + x}{3 - x}$ (c) $\dfrac{3 + 2x}{2 + x}$

4 (a) $\dfrac{3x+5}{(x-1)(x+3)}$ (b) $\dfrac{x+7}{(x-3)(x+2)}$ (c) $\dfrac{x+3}{(2x-1)(3x+2)}$

(d) $\dfrac{x+5}{x+2}$ (e) $\dfrac{2x-3}{x-1}$ (f) $-\dfrac{x+3}{x+1}$

(g) $\dfrac{6x-1}{4(2x-1)(2x+1)}$

5 (a) $\dfrac{2x+1}{\sqrt{x}}$ (b) $\dfrac{3x+3}{\sqrt{x+3}}$ (c) $\dfrac{2x-2}{\sqrt[3]{x-2}}$

Exercise 1.3

1 (a) $x^2 + 10x + 25$ (b) $x^2 - 8x + 16$ (c) $4x^2 + 4x + 1$

(d) $9x^2 - 12x + 4$ (e) $x^2 - 4$ (f) $9x^2 - 16$

2 (a) $x + y + 2 = 0$

(b) $5x + 2y = 0$

(c) $x + y = 0$

3 (a) impossible (b) $(x - 2)$ (c) impossible

(d) impossible (e) impossible (f) $x + y$

4 (a) $(x + 4)^2 + 3$ (b) $(x - 5)^2 - 2$ (c) $(x + 1)^2 - 5$

(d) $(x - 2)^2 - 7$ (e) $(x - 1½)^2 - ¼$ (f) $(x - 2½)^2 - 12¼$

5 (a) $3(x + 1)^2 + 4$ (b) $5(x - 2)^2 - 3$ (c) $2(x + 2½)^2 + ½$

6 (a) $(2x + 3)^2 + 5$ (b) $(3x - 2)^2 - 5$ (c) $(4x + 5)^2 - 3$

7 (a) $(x - 5)(x + 5)$ (b) $4(x - 3)(x + 3)$ (c) $(2x - 3y^2)(2x + 3y^2)$

(d) $(3x - 1)(x - 2)$ (e) $(3x - 2)(x - 1)$ (f) $(3x + 2)(2x - 3)$

(g) $(4x + 5)(2x - 3)$

8 (a) $x^2 + 2 + \dfrac{1}{x^2}$ (b) $x^2 - \dfrac{1}{x^2}$ (c) $x^2 - 1 - \dfrac{6}{x^2}$

Exercise 1.4

1 (a) $12x$ (b) $4x^2$

(c) $2 + 3x$ (d) $12x$

(e) $3xy$ (f) $\dfrac{2x+5y}{4x+3y}$

(g) can't be simplified (h) $\dfrac{2}{3}$

(i) can't be simplified (j) -1

2 (a) $x = \dfrac{bpy}{aqz}$ (b) $x = \dfrac{4by^2}{3\pi aqz}$

3 (a) $\dfrac{6x}{abr^3}$ (b) $\dfrac{3h}{2br^3}$

4 (a) $\dfrac{x+4}{x-3}$ (b) $\dfrac{3x+4}{x+2}$

(c) $\dfrac{x+1}{x-1}$ (d) $\dfrac{x(2x-1)}{x-1}$

(e) $\dfrac{-1}{x^2\sqrt{x^2+1}}$

Exercise 1.5

The answer to the question "why not?" in example 1 (page 16) is that $x^2 + y^2$ has no simple square root. In particular it is not $x + y$. [Remember that $(x + y)^2 = x^2 + 2xy + y^2$.]

1 $(2, 4), (3, 1)$ **2** $(6, -3), (7, 0)$

3 $(1, -1), (-1, 0)$ **4** $(1, 2), (-1, -2)$

Exercise 1.6

1 (a) x^{-1} (b) x^{-5} (c) $x^{1/5}$ (d) $x^{3/5}$ (e) $x^{-1/2}$ (f) $x^{-1/3}$

2 (a) $\frac{1}{x^4}$ (b) 1 (c) $\sqrt[6]{x}$ (d) $\sqrt[4]{x^3}$ (e) $\frac{1}{\sqrt{x^3}}$

3 (a) $4x^{1/3}$ (b) $3x^{-2}$ (c) $5x^{-1/2}$ (d) $\frac{1}{2}x^{-3}$ (e) $6x^0$

4 (a) $x^4 + x^2$ (b) $x^2 + x^{-2}$ (c) $x^{-4} + x^{-7}$

5 (a) $5\sqrt{3}$ (b) $6\sqrt{5}$ (c) $2\sqrt{6}$ (d) $\frac{1}{5}\sqrt{5}$ (e) $\frac{1}{2}\sqrt{3}$

6 (a) $\sqrt{2} + 1$ (b) $\sqrt{6} + 2$ (c) $2(\sqrt{7} - 2)$ (d) $\frac{1}{4}(3 - \sqrt{5})$ (e) $\sqrt{6} + \sqrt{5}$

Exercise 2.1

1 (a) 64.2, 115.8 (b) 53.1, 306.9 (c) 63.4, 243.4

(d) 203.6, 336.4 (e) 120, 240 (f) 108.4, 288.4

2 (a) 64.2, 115.8 (b) 53.1, –53.1 (c) 63.4, –116.6

(d) –23.6, –156.4 (e) 120, –120 (f) –71.5, 108.4

3 (a) $p = 20 \sin 26°$, $q = 20 \cos 26°$ (b) $r = 5.6 \sin 32°$, $s = 5.6 \cos 32°$

(c) $t = 10 \sin 17°$, $u = 10 \cos 17°$ (d) $v = 8.4 \cos 20°$, $w = 8.4 \sin 20°$

Exercise 3.1

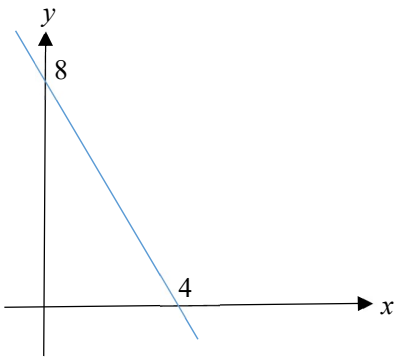
1 (a) $y = -2x + 8$; –2, 8 (b) $y = 4x + 9$; 4, 9

(c) $y = -\frac{1}{5}x + 2$; $-\frac{1}{5}$, 2 (d) $y = \frac{1}{3}x - 5$; $\frac{1}{3}$, –5

(e) $y = -\frac{2}{3}x - 4$; $-\frac{2}{3}$, –4 (f) $y = \frac{5}{2}x - 10$; $\frac{5}{2}$, –10

(g) $y = -\frac{3}{5}x + \frac{17}{5}$; $-\frac{3}{5}$, $\frac{17}{5}$ (h) $y = \frac{7}{4}x + \frac{9}{2}$; $\frac{7}{4}$, $\frac{9}{2}$

2 (a)



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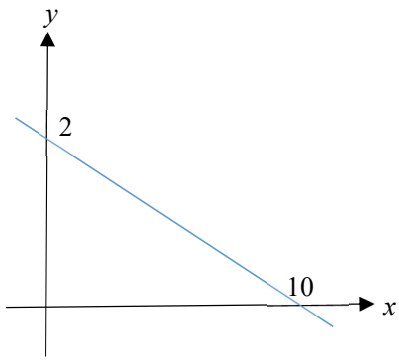

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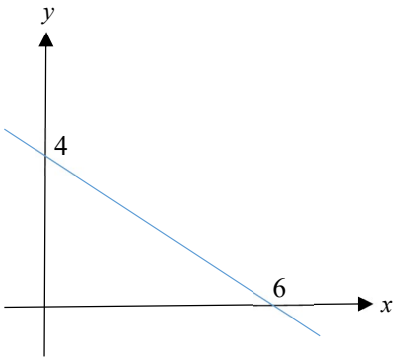

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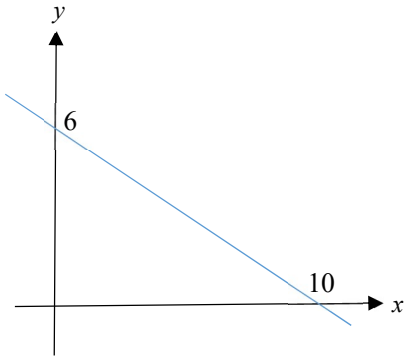

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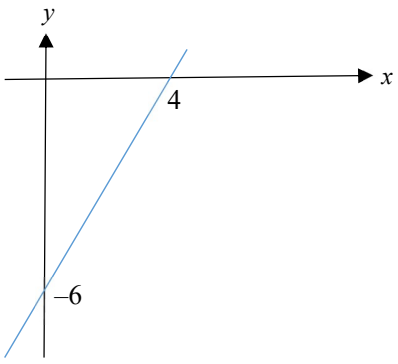

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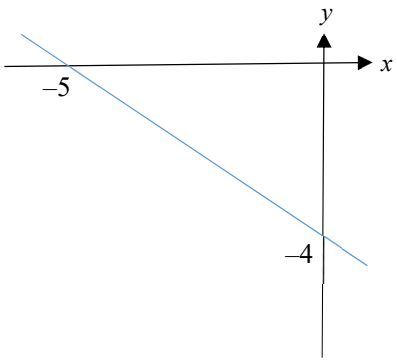

Exercise 3.2

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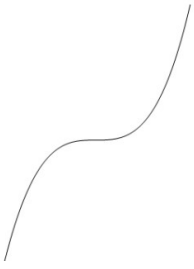
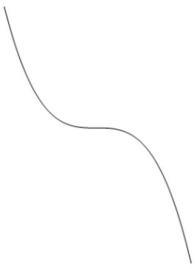
7 

8 

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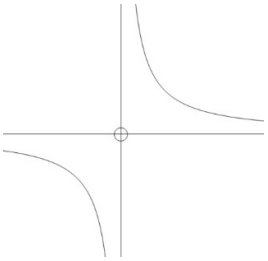

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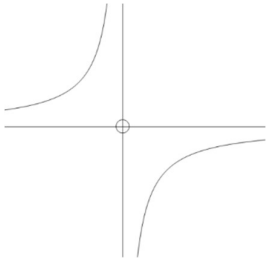

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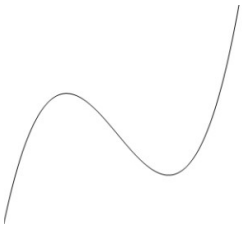

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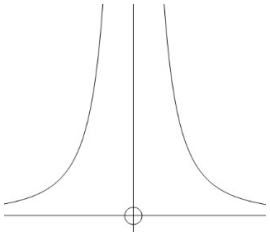

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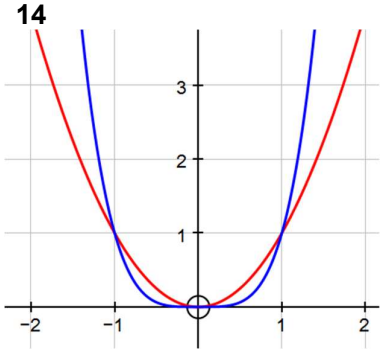
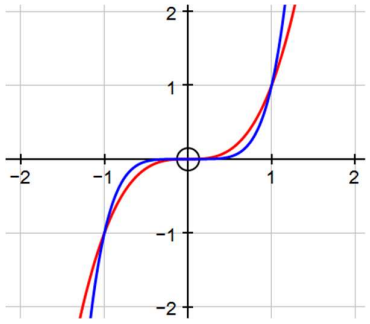


red: $y = x^2$ *blue:* $y = x^4$



red: $y = x^3$ *blue:* $y = x^5$