

**Exercise. 1** Solve the following equations and inequalities.

- a)  $2x^3 - x^2 - 4x + 2 = 0$       *answer:*  $x = \frac{1}{2}, x = \sqrt{2}, x = -\sqrt{2}$
- ą)  $2x^3 + 2x^2 - 5x - 2 = 0$       *answer:*  $x = -2, x = \frac{1-\sqrt{3}}{2}, x = \frac{1+\sqrt{3}}{2}$
- b)  $-3x^2(x+3)(x-5)^2 < 0$       *answer:*  $(-\infty, -3) \cup (0, 5) \cup (5, \infty)$
- c)  $-16x^6 + 8x^5 - 4x^4 + 2x^3 \geq 0$       *answer:*  $[0, \frac{1}{2}]$
- ć)  $\frac{2x+5}{4-x} = 3$       *answer:*  $x = \frac{7}{5}$
- d)  $\frac{1}{x+2} - \frac{x+2}{x-2} = 2$       *answer:*  $x = \frac{-3-\sqrt{33}}{6}, x = \frac{-3+\sqrt{33}}{6}$
- e)  $\frac{6}{3+5x} \geq 3$       *answer:*  $(-\frac{3}{5}, -\frac{1}{5}]$
- ę)  $\frac{-7}{9-2x} \geq \frac{5}{8x+6}$       *answer:*  $[-\frac{87}{46}, -\frac{3}{4}] \cup (\frac{9}{2}, \infty)$
- f)  $\frac{1+x}{1+2x} - \frac{1-2x}{x+1} < -1$       *answer:*  $(-1, \frac{1}{2})$
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- g)  $(0.25)^{3x-1} = (\sqrt{2})^{5-x}$       *answer:*  $x = -\frac{1}{11}$
- h)  $(\sqrt{32})^{3x-5} = (0.5)^{2x-7}$       *answer:*  $x = \frac{39}{19}$
- i)  $5^{|4x-4|} = 25^{3x-4}$       *answer:*  $x = 2$
- j)  $16^{\frac{x}{x+3}} = 4 \cdot (\frac{2^x}{8})^{\frac{1}{2x+5}}$       *answer:*  $x = 3, x = -\frac{7}{3}$
- k)  $8^{x-2} < 2^{4-2x}$       *answer:*  $(-\infty, 2)$
- l)  $(0.3)^{7-x} \leq (0.09)^{x+2}$       *answer:*  $(-\infty, 1]$
- ł)  $\sqrt[5]{8^{3x-1}} > 4^{2x}$       *answer:*  $(-\infty, -\frac{3}{11})$
- m)  $2^{x+2} + 2^x = 20$       *answer:*  $x = 2$
- n)  $2^{2x+1} - 33 \cdot 2^{x-1} + 4 = 0$       *answer:*  $x = -2, x = 3$
- ń)  $7^{-x} - 3 \cdot 7^{x+1} > 4$       *answer:*  $(-\infty, -1)$
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- o)  $\log_2(9x^2 - 20) - \log_2 6 = 2 + \log_2 x$       *answer:*  $x = \frac{10}{3}$
- ó)  $(\log_5 x)^2 + \frac{1}{2} \log_5 5x - 2 = 0$       *answer:*  $x = 5, x = \frac{\sqrt{5}}{25}$
- p)  $\log_3(3^x - 8) = 2 - x$       *answer:*  $x = 2$
- r)  $\log_{0.5}(x - \frac{1}{2}) + \log_{0.5}(x - 1) \geq 1$       *answer:*  $(1, \frac{3}{2}]$
- s)  $\log_3 \sqrt{x} - 2 \log_9 x > 2$       *answer:*  $(0, \frac{1}{81})$
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- ś)  $\sin^2 x + \frac{1}{2} \sin x - \frac{1}{2} = 0$       *answer:*  $x = -\frac{\pi}{2} + 2k\pi \vee x = \frac{\pi}{6} + 2k\pi \vee x = \frac{5\pi}{6} + 2k\pi$
- t)  $1 - \cos x = 2 \sin^2 x$       *answer:*  $x = 2k\pi \vee x = \frac{2\pi}{3} + 2k\pi \vee x = -\frac{2\pi}{3} + 2k\pi$
- u)  $\tan x + \cot x = \frac{4\sqrt{3}}{3}$       *answer:*  $x = \frac{\pi}{3} + k\pi \vee x = \frac{\pi}{6} + k\pi$

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