

ANSWERS

1. (1) 2
(2) 0
(3) $\frac{1}{2}$
(4) -3
(5) 0
(6) 3
(7) -1
(8) -2
(9) 2
(10) $\frac{1}{3}$
(11) $-\frac{3}{2}$
(12) -2
2. (1) 0
(2) 1
(3) 3
(4) 3
(5) $\frac{3}{2}$
(6) 64
3. (1) $2 \log x + \log y$
(2) $3 \log x + 2 \log y - \log z$
(3) $\frac{1}{2} \log x + \frac{2}{3} \log y - 4 \log z$
(4) $\log x + \log y + \log z$
(5) $\log x - \log y - \log z$
(6) $2 \log x - 2 \log y$
(7) $\frac{1}{3} \log x + \frac{1}{3} \log y$
(8) $\log x + \frac{1}{2} \log z$
(9) $\frac{1}{3}(\log x - \log y - \log z)$
(10) $\frac{1}{4} \log x + \frac{1}{2} \log y - \log z$
(11) $\frac{5}{4} \log x - \frac{1}{2} \log z$
(12) $\frac{1}{2} \log x + \log y - 4 \log z$

4. (1) $3^4 = 81$

(2) $7^1 = 7$

(3) $\left(\frac{1}{2}\right)^3 = \frac{1}{8}$

(4) $3^0 = 1$

(5) $4^{-3} = \frac{1}{64}$

(6) $6^{-2} = \frac{1}{36}$

(7) $x^z = y$

(8) $m^{\frac{1}{2}} = n$

6. (1) True

(2) False

(3) True

(4) False

(5) False

(6) False

(7) True

(8) True

5. (1) $\log_8 64 = 2$

(2) $\log_{10} 10000 = 3$

(3) $\log_4 \frac{1}{16} = -2$

(4) $\log_3 \frac{1}{81} = -4$

(5) $\log_{\frac{1}{2}} 32 = -5$

(6) $\log_{\frac{1}{3}} 27 = -3$

(7) $\log_x y = 2z$

(8) $\log_x y = \frac{1}{2}$

7. (1) $S = \{e^{-3}\}$

(2) $S = \{34\}$

(3) $S = \{2, 4\}$

(4) $S = \{5\}$

(5) $S = \{2\}$

(6) $S = \{6\}$

(7) $S = \{5\}$

(8) $S = \{3\}$

8. (1)

$$\log_{\sqrt{b}} x = 2 \log_b x$$

$$\begin{aligned}\log_{\sqrt{b}} x &= \frac{\log x}{\log \sqrt{b}} \\&= \frac{\log x}{\frac{1}{2} \log b} \\&= 2 \frac{\log x}{\log b} \\&= 2 \log_b x \quad \square\end{aligned}$$

(2)

$$\log_{\frac{1}{\sqrt{b}}} \sqrt{x} = -\log_b x$$

$$\begin{aligned}\log_{\frac{1}{\sqrt{b}}} \sqrt{x} &= \frac{\log \sqrt{x}}{\log \frac{1}{\sqrt{b}}} \\&= \frac{\frac{1}{2} \log x}{-\frac{1}{2} \log b} \\&= -\frac{\log x}{\log b} \\&= -\log_b x \quad \square\end{aligned}$$

(3)

$$\log_{b^4} x^2 = \log_b \sqrt{x}$$

$$\begin{aligned}\log_{b^4} x^2 &= \frac{\log x^2}{\log b^4} \\&= \frac{2 \log x}{4 \log b} \\&= \frac{1 \log x}{2 \log b} \\&= \frac{1}{2} \log_b x \\&= \log_b \sqrt{x} \quad \square\end{aligned}$$

9. (1) $2x + y$

(2) $x + 2$

(3) $x - y + z$

(4) $y - 1$

(5) $y - x$

(6) $y + z - x$

(7) $1 - x + y$

(8) $x + y - z + 3$

10. (1) $S = \{2.402\}$

(2) $S = \{0.369\}$

(3) $S = \{-7.213\}$

(4) $S = \{0.438\}$

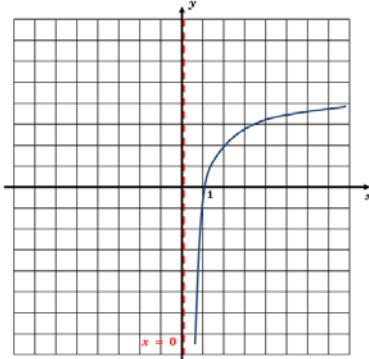
(5) $S = \{-1.652\}$

(6) $S = \{-\ln 4\}$

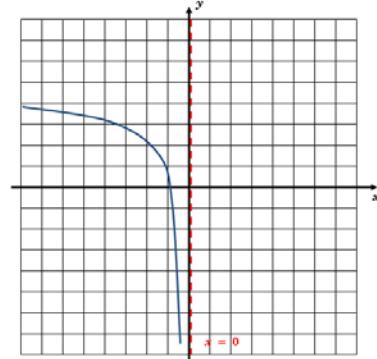
(7) $S = \{\log_5 4\}$

(8) $S = \{\ln 5\}$

11. (1)



(2)



$$\text{Dom}(f) =]0, +\infty[$$

$$\text{R}(f) = \mathbb{R}$$

Zeros: 1

Y-intercept: None

Variation:

$$f(x) \nearrow \text{ if } x \in]0, +\infty[$$

$$f(x) \searrow \text{ if } x \in \emptyset$$

Extremums: Max: None, Min: None

Sign:

$$f(x) \geq 0 \text{ if } x \in]0, 1]$$

$$f(x) \leq 0 \text{ if } x \in [1, +\infty[$$

$$\text{Dom}(f) =]-\infty, 0[$$

$$\text{R}(f) = \mathbb{R}$$

Zeros: -1

Y-intercept: None

Variation:

$$f(x) \nearrow \text{ if } x \in \emptyset$$

$$f(x) \searrow \text{ if } x \in]-\infty, 0[$$

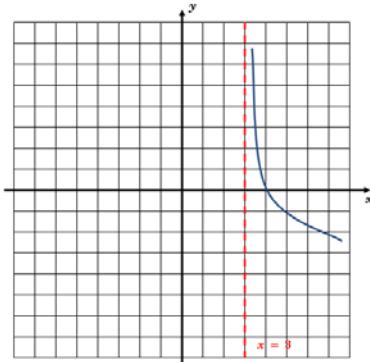
Extremums: Max: None, Min: None

Sign:

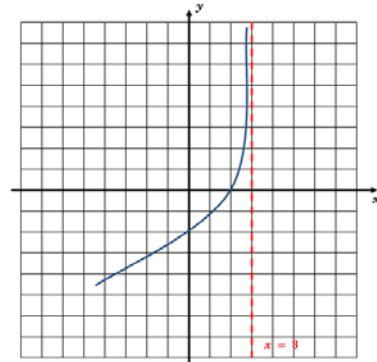
$$f(x) \geq 0 \text{ if } x \in]-\infty, -1]$$

$$f(x) \leq 0 \text{ if } x \in [-1, 0[$$

(3)



(4)



$$\text{Dom}(f) =]3, +\infty[$$

$$\text{R}(f) = \mathbb{R}$$

Zeros: 4

Y-intercept: None

Variation:

$$f(x) \nearrow \text{ if } x \in \emptyset$$

$$f(x) \searrow \text{ if } x \in]3, +\infty[$$

Extremums: Max: None, Min: None

Sign:

$$f(x) \geq 0 \text{ if } x \in]3, 4]$$

$$f(x) \leq 0 \text{ if } x \in [4, +\infty[$$

$$\text{Dom}(f) =]-\infty, 3[$$

$$\text{R}(f) = \mathbb{R}$$

Zeros: 2

Y-intercept: -2

Variation:

$$f(x) \nearrow \text{ if } x \in]-\infty, 3[$$

$$f(x) \searrow \text{ if } x \in \emptyset$$

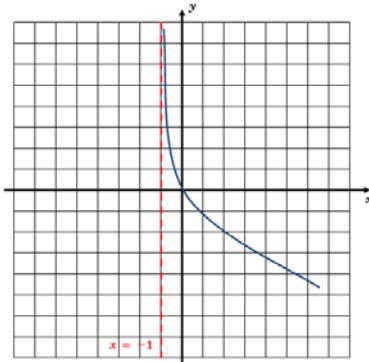
Extremums: Max: None, Min: None

Sign:

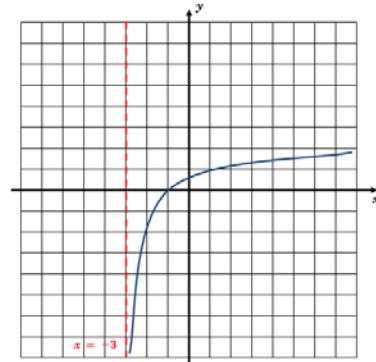
$$f(x) \geq 0 \text{ if } x \in]2, 3[$$

$$f(x) \leq 0 \text{ if } x \in]-\infty, 2[$$

(5)



(6)



$$\text{Dom}(f) =] - 1, +\infty[$$

$$R(f) = \mathbb{R}$$

Zeros: 0

Y-intercept: 0

Variation:

$$f(x) \nearrow \text{ if } x \in \emptyset$$

$$f(x) \searrow \text{ if } x \in] - 1, +\infty[$$

Extremums: Max: None, Min: None

Sign:

$$f(x) \geq 0 \text{ if } x \in] - 1, 0[$$

$$f(x) \leq 0 \text{ if } x \in] 0, +\infty[$$

$$\text{Dom}(f) =] - 3, +\infty[$$

$$R(f) = \mathbb{R}$$

Zeros: -1

$$\text{Y-intercept: } 2 \ln \frac{3}{2}$$

Variation:

$$f(x) \nearrow \text{ if } x \in] - 3, +\infty[$$

$$f(x) \searrow \text{ if } x \in \emptyset$$

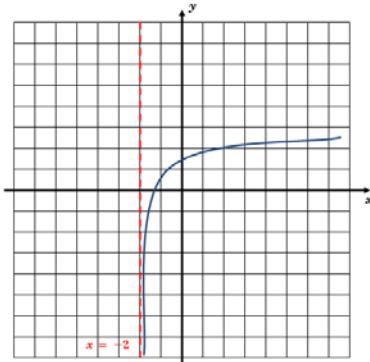
Extremums: Max: None, Min: None

Sign:

$$f(x) \geq 0 \text{ if } x \in [- 1, +\infty[$$

$$f(x) \leq 0 \text{ if } x \in] - 3, - 1]$$

(7)



$$\text{Dom}(f) =] - 2, +\infty[$$

$$\text{R}(f) = \mathbb{R}$$

Zeros: -1.5

Y-intercept: $\ln 4$

Variation:

$$f(x) \nearrow \text{ if } x \in] - 2, +\infty[$$

$$f(x) \searrow \text{ if } x \in \emptyset$$

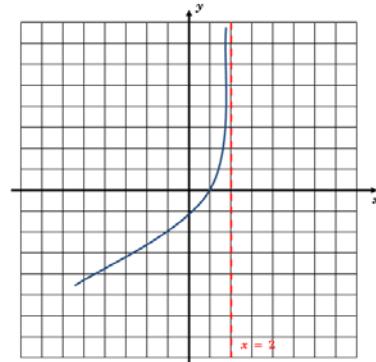
Extremums: Max: None, Min: None

Sign:

$$f(x) \geq 0 \text{ if } x \in [-1.5, +\infty[$$

$$f(x) \leq 0 \text{ if } x \in] - 2, -1.5]$$

(8)



$$\text{Dom}(f) =] - \infty, 2[$$

$$\text{R}(f) = \mathbb{R}$$

Zeros: $\frac{5}{3}$

Y-intercept: $-2 \ln 6$

Variation:

$$f(x) \nearrow \text{ if } x \in] - \infty, 2[$$

$$f(x) \searrow \text{ if } x \in \emptyset$$

Extremums: Max: None, Min: None

Sign:

$$f(x) \geq 0 \text{ if } x \in [\frac{5}{3}, 2[$$

$$f(x) \leq 0 \text{ if } x \in] - \infty, \frac{5}{3}[$$

12. (1) $f^{-1}(x) = 2^{x+5} + 3$

(2) $f^{-1}(x) = 3^{\frac{x-1}{3}} - 3$

(3) $f^{-1}(x) = \frac{1}{2}10^{\frac{2-x}{2}} + 1$

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

(5) $f^{-1}(x) = \log_2(x + 3)$

(6) $f^{-1}(x) = \frac{1}{3} \log_3 \left(\frac{x+1}{2} \right)$

(7) $f^{-1}(x) = -\ln \left(\frac{2-x}{5} \right)$

(8) $f^{-1}(x) = -\frac{1}{2} \ln \left(\frac{1-x}{2} \right)$

13. 37 years.

14. 9 years.

15. 53 years old.

16. (a) $f(t) = 10000 \cdot 2^{1.5t}$. Where t is
the number of hours.

(b) 28 284 bacteria.

(c) 92.88 minutes.