

< 1 ページ. 円周率 >

問1の解答

$$(1) \ell = 2\pi r = 6\pi(\text{cm})$$

$$(2) \ell = 2\pi r$$

問2の解答

$$(1) 2\pi r \times \frac{1}{2} = \pi r$$

$$(2) 2\pi r \times \frac{1}{4} = \frac{\pi}{2}r$$

$$(3) 2\pi r \times \frac{1}{6} = \frac{\pi}{3}r$$

< 2 ページ. 弧度法 1 >

解答

度数法	0°	30°	45°	60°	90°	120°	135°	150°	180°	210°	225°	240°	270°	300°	315°	330°	360°
弧度法	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2}{3}\pi$	$\frac{3}{4}\pi$	$\frac{5}{6}\pi$	$\pi$	$\frac{7}{6}\pi$	$\frac{5}{4}\pi$	$\frac{4}{3}\pi$	$\frac{3}{2}\pi$	$\frac{5}{3}\pi$	$\frac{7}{4}\pi$	$\frac{11}{6}\pi$	$2\pi$



< 4 ページ. 弧度法 3 >

問 1 の解答

度数法	45°	60°	90°	120°	180°	360°
弧度法 $\theta$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2}{3}\pi$	$\pi$	$2\pi$
弧の長さ $\ell$	$\frac{\pi}{4}r$	$\frac{\pi}{3}r$	$\frac{1}{2}\pi r$	$\frac{2}{3}\pi r$	$\pi r$	$2\pi r$
面積 $S$	$\frac{\pi}{8}r^2$	$\frac{\pi}{6}r^2$	$\frac{\pi}{4}r^2$	$\frac{\pi}{3}r^2$	$\frac{1}{2}\pi r^2$	$\pi r^2$

問 2 の解答

(1)  $\ell = \theta r$

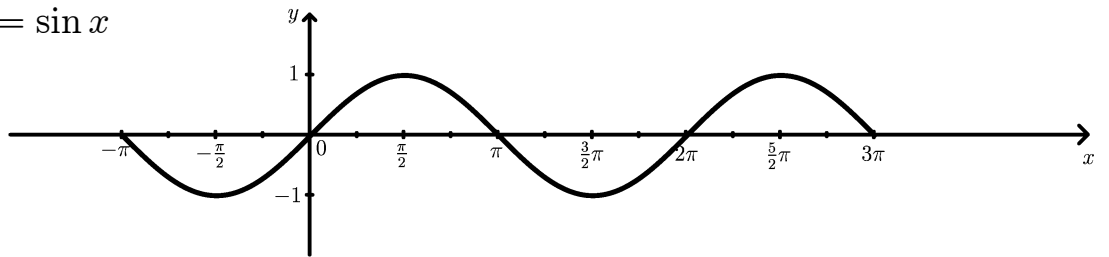
(2)  $S = \frac{1}{2}\theta r^2$

## ＜ 5 ページ. 三角関数のグラフ ＞

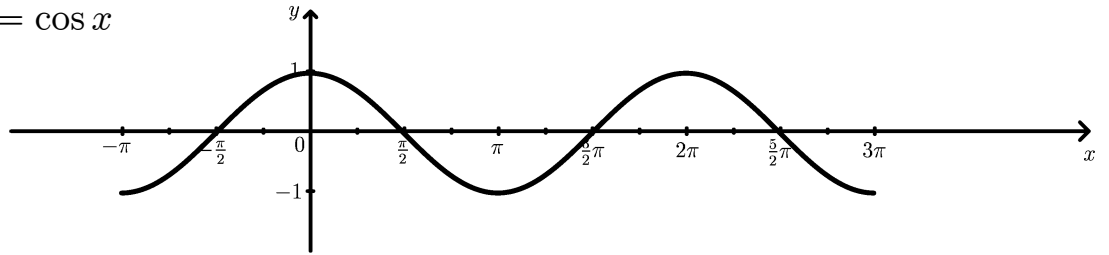
### 解答

$x$	度数法	-180°	-135°	-90°	-45°	0°	45°	90°	135°	180°	225°	270°	315°	360°	405°	450°	495°	540°
	弧度法	$-\pi$	$-\frac{3}{4}\pi$	$-\frac{\pi}{2}$	$-\frac{\pi}{4}$	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$	$\frac{3}{4}\pi$	$\pi$	$\frac{5}{4}\pi$	$\frac{3}{2}\pi$	$\frac{7}{4}\pi$	$2\pi$	$\frac{9}{4}\pi$	$\frac{5}{2}\pi$	$\frac{11}{4}\pi$	$3\pi$
$\sin x$		0	$-\frac{\sqrt{2}}{2}$	-1	$-\frac{\sqrt{2}}{2}$	0	$\frac{\sqrt{2}}{2}$	1	$\frac{\sqrt{2}}{2}$	0	$-\frac{\sqrt{2}}{2}$	-1	$-\frac{\sqrt{2}}{2}$	0	$\frac{\sqrt{2}}{2}$	1	$\frac{\sqrt{2}}{2}$	0
$\cos x$		-1	$-\frac{\sqrt{2}}{2}$	0	$\frac{\sqrt{2}}{2}$	1	$\frac{\sqrt{2}}{2}$	0	$-\frac{\sqrt{2}}{2}$	-1	$-\frac{\sqrt{2}}{2}$	0	$\frac{\sqrt{2}}{2}$	1	$\frac{\sqrt{2}}{2}$	0	$-\frac{\sqrt{2}}{2}$	-1

(1)  $y = \sin x$

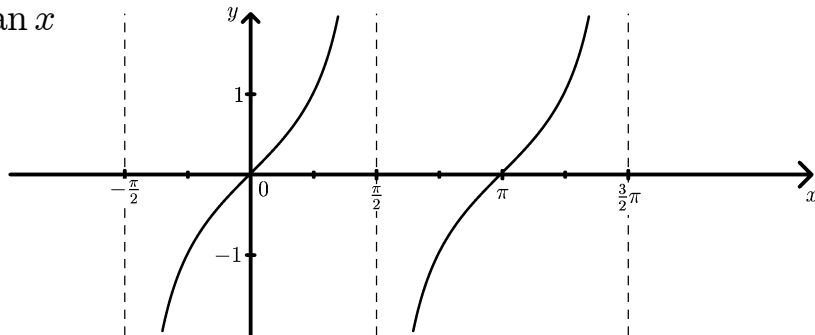


(2)  $y = \cos x$



$x$	度数法	-90°	-60°	-45°	-30°	0°	30°	45°	60°	90°	120°	135°	150°	180°	210°	225°	240°	270°
	弧度法	$-\frac{\pi}{2}$	$-\frac{\pi}{3}$	$-\frac{\pi}{4}$	$-\frac{\pi}{6}$	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2}{3}\pi$	$\frac{3}{4}\pi$	$\frac{5}{6}\pi$	$\pi$	$\frac{7}{6}\pi$	$\frac{5}{4}\pi$	$\frac{4}{3}\pi$	$\frac{3}{2}\pi$
$\tan x$		$\times$	$-\sqrt{3}$	-1	$-\frac{\sqrt{3}}{3}$	0	1	$\frac{\sqrt{3}}{3}$	$\sqrt{3}$	$\times$	$-\sqrt{3}$	-1	$-\frac{\sqrt{3}}{3}$	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	$\times$

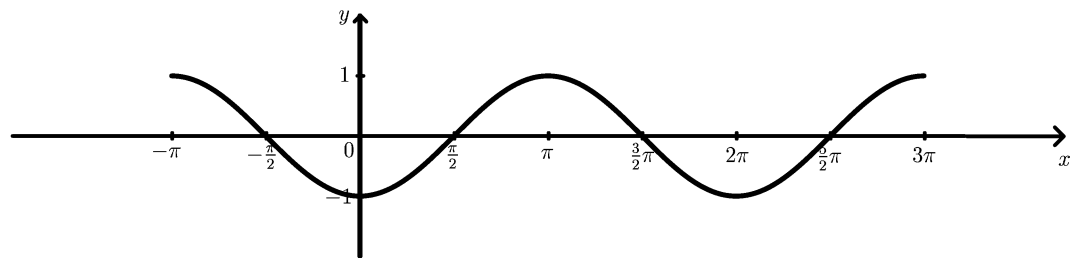
(3)  $y = \tan x$



< 6 ページ. 正弦波 1 >

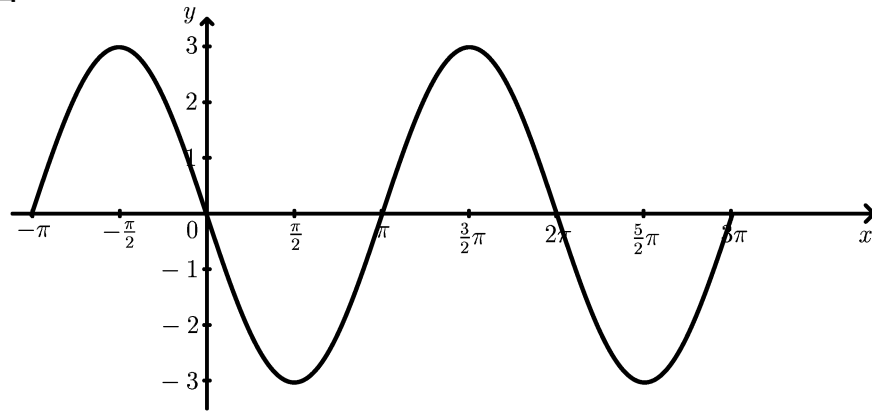
解答

$x$	$-\pi$	$-\frac{\pi}{2}$	$0$	$\frac{\pi}{2}$	$\pi$	$\frac{3}{2}\pi$	$2\pi$	$\frac{5}{2}\pi$	$3\pi$
$\sin x$	$0$	$-1$	$0$	$1$	$0$	$-1$	$0$	$1$	$0$
$\sin\left(x - \frac{\pi}{2}\right)$	$1$	$0$	$-1$	$0$	$1$	$0$	$-1$	$0$	$1$



< 7ページ. 正弦波 2 >

解答

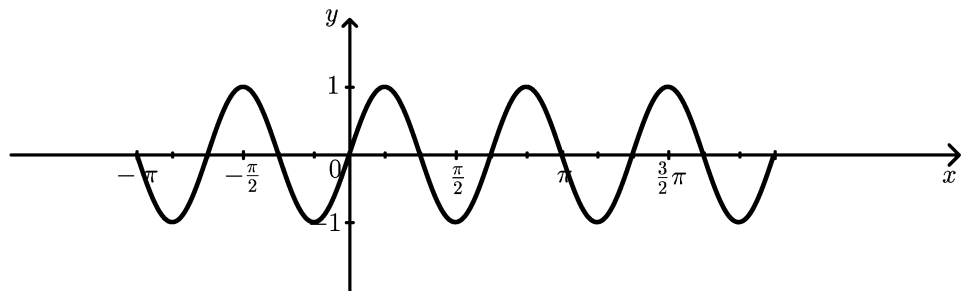


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< 8 ページ. 正弦波 3 >

解答

$x$	$-\frac{2}{3}\pi$	$-\frac{\pi}{2}$	$-\frac{\pi}{3}$	$-\frac{\pi}{6}$	$0$	$\frac{\pi}{6}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2}{3}\pi$	$\frac{5}{6}\pi$	$\pi$	$\frac{7}{6}\pi$	$\frac{4}{3}\pi$
$3x$	$-2\pi$	$-\frac{3}{2}\pi$	$-\pi$	$-\frac{\pi}{2}$	$0$	$\frac{\pi}{2}$	$\pi$	$\frac{3}{2}\pi$	$2\pi$	$\frac{5}{2}\pi$	$3\pi$	$\frac{7}{2}\pi$	$4\pi$
$\sin(3x)$	$0$	$1$	$0$	$-1$	$0$	$1$	$0$	$-1$	$0$	$1$	$0$	$-1$	$0$

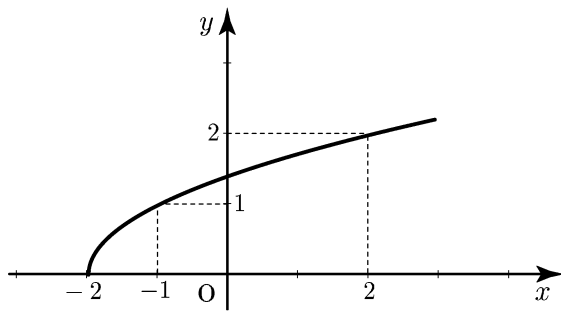


周期  $\frac{2}{3}\pi$

< 9 ページ. 無理関数 1 >

解答

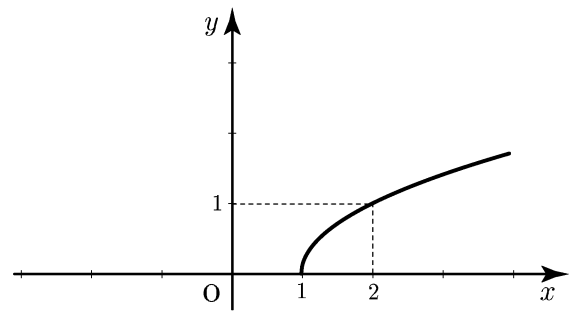
(1)  $y = \sqrt{x + 2}$



定義域  $x \geq -2$

値域  $y \geq 0$

(2)  $y = \sqrt{x - 1}$



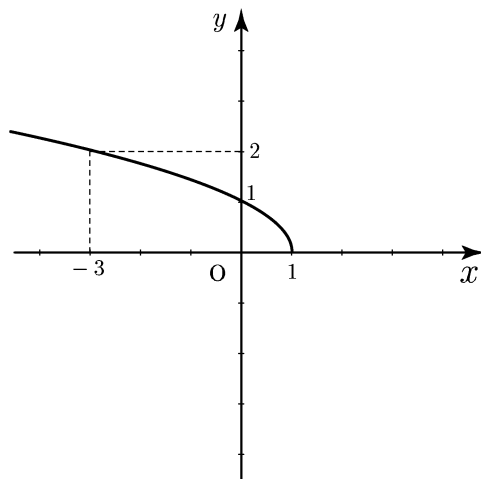
定義域  $x \geq 1$

値域  $y \geq 0$

< 10 ページ. 無理関数 2 >

解答

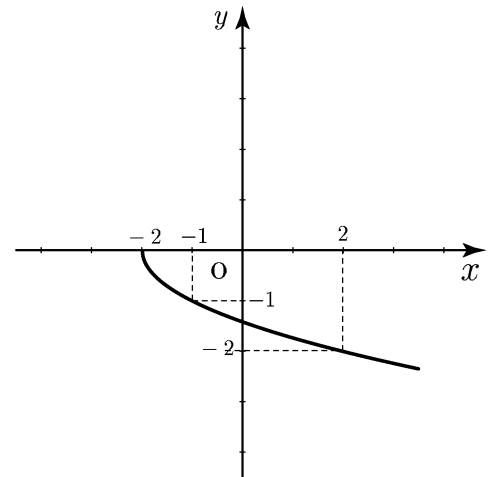
(1)  $y = \sqrt{-x + 1}$



定義域  $x \leq 1$

値域  $y \geq 0$

(2)  $y = -\sqrt{x + 2}$



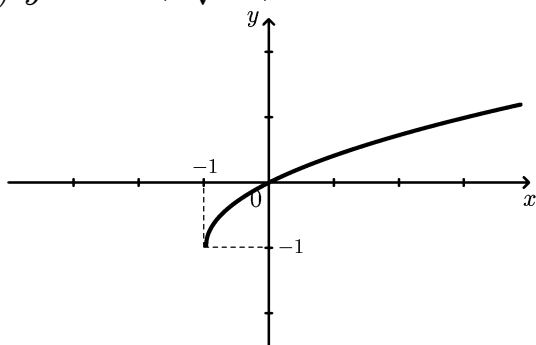
定義域  $x \geq -2$

値域  $y \leq 0$

< 11 ページ. 無理関数 3 >

解答

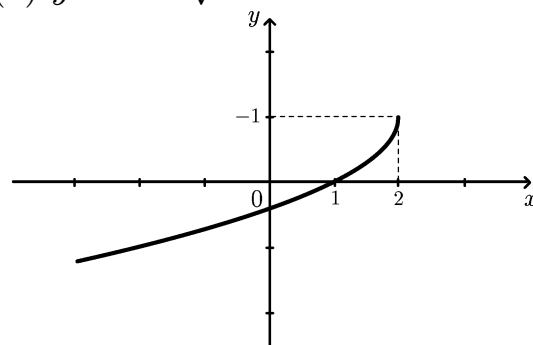
(1)  $y = -1 + \sqrt{x + 1}$



定義域  $x \geq -1$

値域  $y \geq -1$

(2)  $y = 1 - \sqrt{2 - x}$

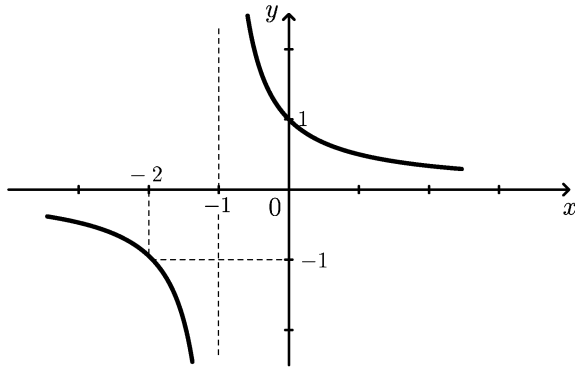


定義域  $x \leq 2$

値域  $y \leq 1$

< 12 ページ. 分数関数 1 >

解答

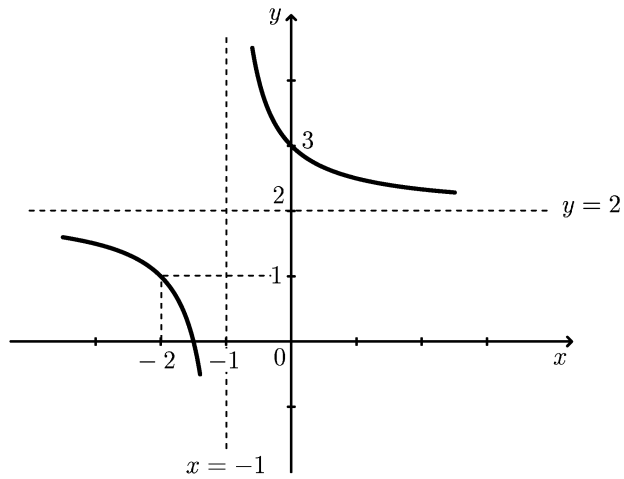


定義域  $x \neq -1$

値域  $y \neq 0$

< 13 ページ. 分数関数 2 >

解答



定義域  $x \neq -1$

値域  $y \neq 2$

漸近線  $x = -1$   
 $y = 2$

< 14 ページ. 関数 1 >

解答

$$(1) f(x) = 2 - \sqrt{x-1} \quad (2) f(x) = 2 + \sqrt{1-x} \quad (3) f(x) = 1 + \frac{1}{x+2}$$

$$\underline{\text{定義域 } x \geq 1}$$

$$\underline{\text{定義域 } x \leq 1}$$

$$\underline{\text{定義域 } x \neq -2}$$

$$\underline{\text{値域 } y \leq 2}$$

$$\underline{\text{値域 } y \geq 2}$$

$$\underline{\text{値域 } y \neq 1}$$

< 15 ページ. 関数 2 >

解答

(1)  $f(x) = \log_2(1 - x)$

定義域  $x < 1$

値域 実数全体

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

定義域 実数全体

値域  $y > -1$

(3)  $f(x) = 2 - 3^x$

定義域 実数全体

値域  $y < 2$

< 16 ページ. 関数 3 >

解答

(1)  $f(x) = 3 + \sin x$

定義域 実数全体

値域  $2 \leq y \leq 4$

(2)  $f(x) = 1 + 2 \cos x$

定義域 実数全体

値域  $-1 \leq y \leq 3$

(3)  $f(x) = 2 + 3 \sin x$

定義域 実数全体

値域  $-1 \leq y \leq 5$

(4)  $f(x) = 2 + 4 \cos(3x)$

定義域 実数全体

値域  $-2 \leq y \leq 6$

< 17 ページ. 関数 4 >

解答

(1)  $f(x) = \tan(3x)$

$$3x \neq \pm \frac{\pi}{2} \pm n\pi$$

定義域  $x \neq \pm \frac{\pi}{6} \pm \frac{n}{3}\pi$  ( $n = 0, 1, 2, \dots$ )

値域 実数全体 ( $n$  は整数)

(2)  $f(x) = \tan(\pi x)$

$$\pi x \neq \pm \frac{\pi}{2} \pm n\pi$$

定義域  $x \neq \pm \frac{1}{2} \pm n$  ( $n = 0, 1, 2, \dots$ )

値域 実数全体 ( $n$  は整数)

< 18 ページ. 1 対 1 関数 >

解答

(1)  $y = 3x - 2$

(2)  $y = x^3 - x$

(3)  $y = \frac{1}{x} (x \neq 0)$

(答) 1 対 1

(答) 1 対 1 でない

(答) 1 対 1

< 19 ページ. 逆関数 1 >

解答

$$(1) f(x) = 3x - 2 \quad (2) f(x) = \frac{1}{x} + 2 \quad (3) f(x) = \sqrt{x}$$

$$\begin{array}{lll} \text{(解)} b = f(a) = 3a - 2 & \text{(解)} b = f(a) = \frac{1}{a} + 2 & \text{(解)} b = f(a) = \sqrt{a} \\ 3a = b + 2 & \frac{1}{a} = b - 2 & b^2 = a \\ a = \frac{b + 2}{3} = f^{-1}(b) & a = \frac{1}{b - 2} = f^{-1}(b) & a = b^2 = f^{-1}(b) \\ f^{-1}(b) = \frac{b + 2}{3} & f^{-1}(b) = \frac{1}{b - 2} & f^{-1}(b) = b^2 \end{array}$$

< 20 ページ. 逆関数 2 >

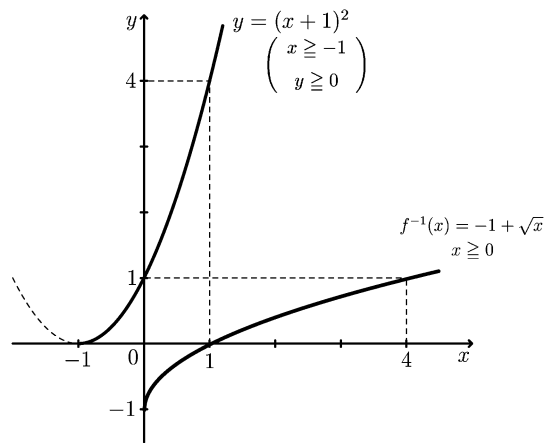
解答

$$(1) f(x) = 3x + 2 \quad (2) f(x) = \frac{1}{x-2} \quad (3) f(x) = \sqrt{x}$$

$$\begin{array}{lll} \text{(解)} b = f(a) = 3a - 2 & \text{(解)} b = f(a) = \frac{1}{a-2} & \text{(解)} b = f(a) = \sqrt{a} \\ a = \frac{b-2}{3} = f^{-1}(b) & a - 2 = \frac{1}{b} & b^2 = a = f^{-1}(b) \\ f^{-1}(x) = \frac{x-2}{3} & a = \frac{1}{b} + 2 = f^{-1}(b) & f^{-1}(x) = x^2 \\ & f^{-1}(x) = \frac{1}{x} + 2 & \end{array}$$

< 21 ページ. 逆関数 3 >

解答

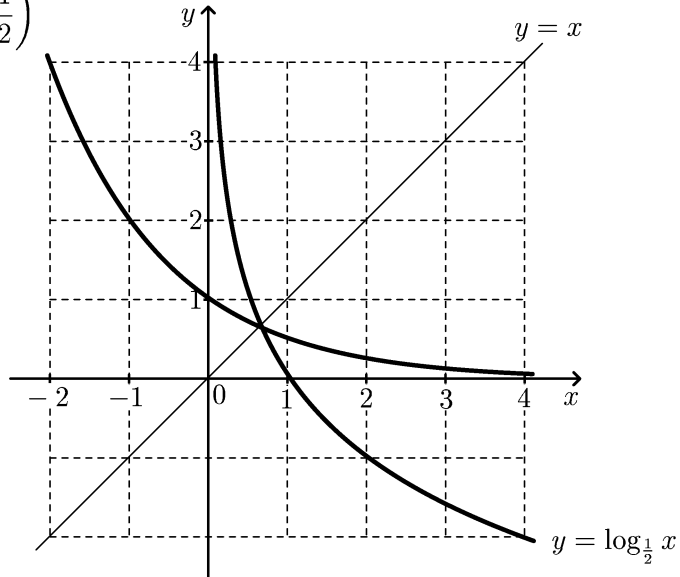


$$\begin{aligned} b = f(a) &\Leftrightarrow a + 1 = \sqrt{b} \\ a \geq -1 &\quad a = -1 + \sqrt{b} \\ b \geq 0 &\quad f^{-1}(x) = -1 + \sqrt{x} \end{aligned}$$

< 22 ページ. 逆関数 4 >

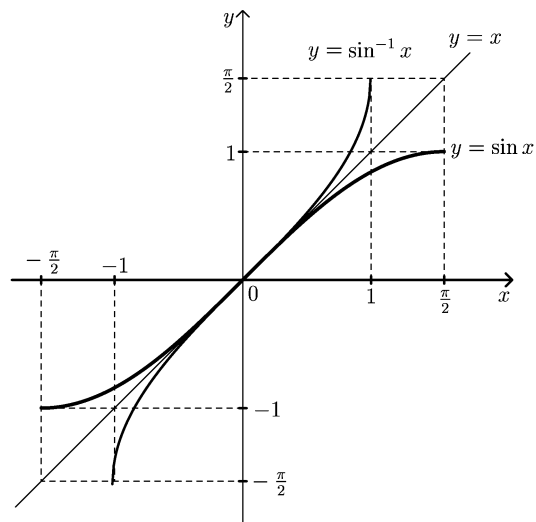
解答

$$y = \left(\frac{1}{2}\right)^x$$



## < 23 ページ. 逆三角関数 1 >

### 問1の解答



### 問2の解答

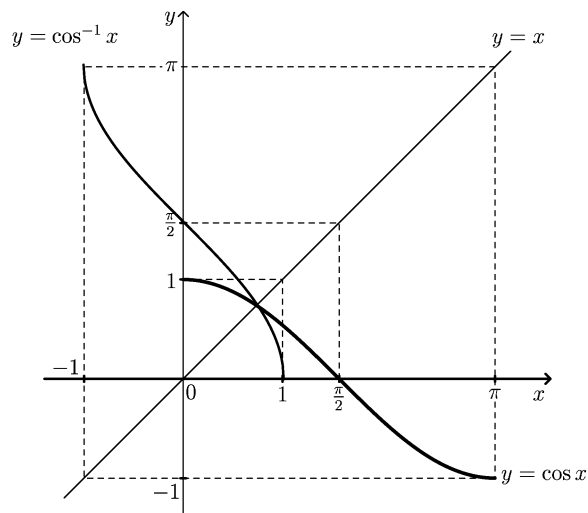
$\theta$	$-\frac{\pi}{2}$	$-\frac{\pi}{3}$	$-\frac{\pi}{4}$	$-\frac{\pi}{6}$	$0$	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$
$\sin \theta$	$-1$	$-\frac{\sqrt{3}}{2}$	$-\frac{\sqrt{2}}{2}$	$-\frac{1}{2}$	$0$	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	$1$

### 問3の解答

- (1)  $\sin^{-1} \left( \frac{\sqrt{2}}{2} \right) = \frac{\pi}{4}$
- (2)  $\sin^{-1} \left( \frac{\sqrt{3}}{2} \right) = \frac{\pi}{3}$
- (3)  $\sin^{-1} \left( -\frac{1}{2} \right) = -\frac{\pi}{6}$

## < 24 ページ. 逆三角関数 2 >

### 問1の解答



### 問2の解答

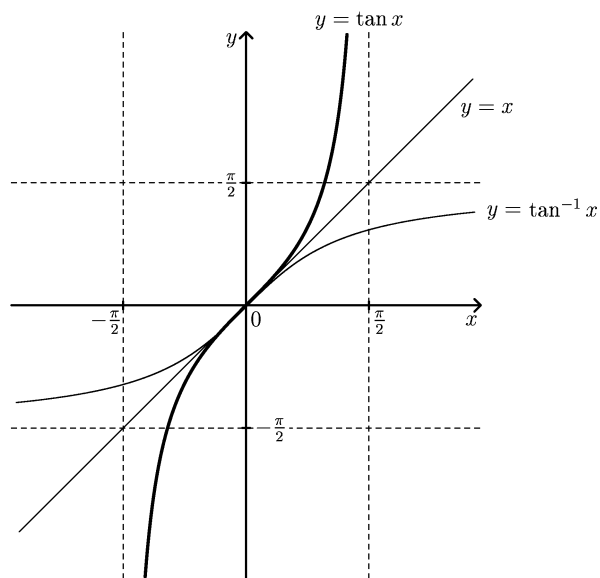
$\theta$	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{3\pi}{4}$	$\frac{5\pi}{6}$	$\pi$
$\cos \theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0	$-\frac{1}{2}$	$-\frac{\sqrt{2}}{2}$	$-\frac{\sqrt{3}}{2}$	-1

### 問3の解答

- (1)  $\cos^{-1} \left( \frac{\sqrt{3}}{2} \right) = \frac{\pi}{6}$
- (2)  $\cos^{-1} \left( -\frac{\sqrt{2}}{2} \right) = \frac{3}{4}\pi$
- (3)  $\cos^{-1} \left( -\frac{1}{2} \right) = \frac{2}{3}\pi$

## < 25 ページ. 逆三角関数 3 >

### 問1の解答



### 問2の解答

$\theta$	$-\frac{\pi}{3}$	$-\frac{\pi}{4}$	$-\frac{\pi}{6}$	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$
$\tan \theta$	$-\sqrt{3}$	-1	$-\frac{\sqrt{3}}{3}$	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$

### 問3の解答

$$(1) \tan^{-1}(1) = \frac{\pi}{4}$$

$$(2) \tan^{-1}\left(-\frac{\sqrt{3}}{3}\right) = -\frac{\pi}{6}$$

$$(3) \tan^{-1}(-\sqrt{3}) = -\frac{\pi}{3}$$

< 26 ページ. 数列の極限 1 >

解答

(増加しながら) 1 に限りなく近づいていく

< 27 ページ. 数列の極限 2 >

解答

$$(1) \quad \lim_{n \rightarrow \infty} \frac{n+1}{2n-1} = \lim_{n \rightarrow \infty} \frac{1 + \frac{1}{n}}{2 - \frac{1}{n}} = \frac{1}{2}$$

$$(2) \quad \lim_{n \rightarrow \infty} \frac{n^2 + 3n + 1}{2n^2 + 1} = \lim_{n \rightarrow \infty} \frac{1 + \frac{3}{n} + \frac{1}{n^2}}{2 + \frac{1}{n^2}} = \frac{1}{2}$$

< 28 ページ. 数列の極限 3 >

解答

$$(1) \lim_{n \rightarrow \infty} (n^3 + n) = +\infty$$

$$(2) \lim_{n \rightarrow \infty} (5 - n^2) = -\infty$$

< 29 ページ. 数列の極限 4 >

解答

$$(1) \frac{3}{2}, \frac{9}{4}, \frac{27}{8}, \frac{81}{16}, \dots, \left(\frac{3}{2}\right)^n, \dots \quad \lim_{n \rightarrow \infty} \left(\frac{3}{2}\right)^n = +\infty$$

$$(2) \frac{2}{3}, \frac{4}{9}, \frac{8}{27}, \frac{16}{81}, \dots, \left(\frac{2}{3}\right)^n, \dots \quad \lim_{n \rightarrow \infty} \left(\frac{2}{3}\right)^n = 0$$

$$(3) -\frac{2}{3}, \frac{4}{9}, -\frac{8}{27}, \frac{16}{81}, \dots, \left(-\frac{2}{3}\right)^n, \dots \quad \lim_{n \rightarrow \infty} \left(-\frac{2}{3}\right)^n = 0$$

$$(4) -\frac{3}{2}, \frac{9}{4}, -\frac{27}{8}, \frac{81}{16}, \dots, \left(-\frac{3}{2}\right)^n, \dots \quad \text{振動する}$$

$$(5) -\frac{3}{2}, -\frac{9}{4}, -\frac{27}{8}, -\frac{81}{16}, \dots, -\left(\frac{3}{2}\right)^n, \dots \quad \lim_{n \rightarrow \infty} -\left(\frac{3}{2}\right)^n = -\infty$$

< 30 ページ. 無限級数 >

解答

$$\begin{aligned} S_n &= \frac{1}{3} + \frac{1}{9} + \cdots + \frac{1}{3^n} \\ -) \frac{1}{3} S_n &= \frac{1}{9} + \frac{1}{27} + \cdots + \frac{1}{3^{n+1}} \\ \hline \left(1 - \frac{1}{3}\right) S_n &= \frac{1}{3} - \frac{1}{3^{n+1}} \\ \frac{2}{3} S_n &= \frac{1}{3} - \frac{1}{3^{n+1}} \\ S_n &= \frac{1}{2} - \frac{1}{2 \times 3^n} \\ S &= \lim_{n \rightarrow \infty} S_n = \frac{1}{2} \end{aligned}$$

< 31 ページ. 循環小数 >

解答

$$S_n = 7 \times \left(\frac{1}{10}\right) + 7 \times \left(\frac{1}{10}\right)^2 + \cdots + 7 \times \left(\frac{1}{10}\right)^n$$

$$-) \quad \frac{1}{10}S_n = 7 \times \left(\frac{1}{10}\right)^2 + 7 \times \left(\frac{1}{10}\right)^3 + \cdots + 7 \times \left(\frac{1}{10}\right)^{n+1}$$

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$$\left(1 - \frac{1}{10}\right)S_n = 7 \times \left(\frac{1}{10}\right) - 7 \times \left(\frac{1}{10}\right)^{n+1}$$

$$\frac{9}{10}S_n = \frac{7}{10} - \frac{7}{10^{n+1}}$$

$$S_n = \frac{7}{9} - \frac{7}{9 \times 10^n}$$

$$S = \lim_{n \rightarrow \infty} S_n = \frac{7}{9}$$

< 32 ページ. 関数の極限 >

解答

$$(1) \lim_{x \rightarrow 2} \frac{7x + 3}{x + 1} = \frac{14 + 3}{2 + 1} = \frac{17}{3}$$

$$(2) \lim_{x \rightarrow 2} \frac{x^2 - x - 2}{x^2 - 4} = \lim_{x \rightarrow 2} \frac{x + 1}{x + 2} = \frac{3}{4}$$

$$(3) \lim_{x \rightarrow 3} \frac{x^2 - 2x - 3}{x - 3} = \lim_{x \rightarrow 3} (x + 1) = 4$$

$$(4) \lim_{h \rightarrow 0} \frac{(4 + h)^2 - 4^2}{h} = \lim_{h \rightarrow 0} (8 + h) = 8$$

## < 33 ページ. パスカルの三角形 >

### 問1の解答

$$(1) (a+b)^4 = (a+b)(a+b)^3 = (a+b)(a^3 + 3a^2b + 3ab^2 + b^3)$$

$$= \boxed{1} \times a^4 + \boxed{4} \times a^3b + \boxed{6} \times a^2b^2 + \boxed{4} \times ab^3 + \boxed{1} \times b^4$$

$$(2) (a+b)^5 = (a+b) \left( \boxed{1} \times a^4 + \boxed{4} \times a^3b + \boxed{6} \times a^2b^2 + \boxed{4} \times ab^3 + \boxed{1} \times b^4 \right)$$

$$= \boxed{1} \times a^5 + \boxed{5} \times a^4b + \boxed{10} \times a^3b^2 + \boxed{10} \times a^2b^3 + \boxed{5} \times ab^4 + \boxed{1} \times b^5$$

### 問2の解答

$$(a+b)^0 = 1 \dots\dots\dots 1$$

$$(a+b)^1 = 1 \times a + 1 \times b \dots\dots\dots 1 \quad 1$$

$$(a+b)^2 = 1 \times a^2 + 2 \times ab + 1 \times b^2 \dots\dots\dots 1 \quad 2 \quad 1$$

$$(a+b)^3 = 1 \times a^3 + 3 \times a^2b + 3 \times ab^2 + 1 \times b^3 \dots\dots\dots 1 \quad 3 \quad 3 \quad 1$$

$$(a+b)^4 = \boxed{1} \times a^4 + \boxed{4} \times a^3b + \boxed{6} \times a^2b^2 + \boxed{4} \times ab^3 + \boxed{1} \times b^4 \dots\dots\dots \boxed{1} \quad \boxed{4} \quad \boxed{6} \quad \boxed{4} \quad \boxed{1}$$

$$(a+b)^5 = \boxed{1} \times a^5 + \boxed{5} \times a^4b + \boxed{10} \times a^3b^2 + \boxed{10} \times a^2b^3 + \boxed{5} \times ab^4 + \boxed{1} \times b^5 \dots\dots\dots \boxed{1} \quad \boxed{5} \quad \boxed{10} \quad \boxed{10} \quad \boxed{5} \quad \boxed{1}$$

$$(a+b)^6 = \boxed{1} \times a^6 + \boxed{6} \times a^5b + \boxed{15} \times a^4b^2 + \boxed{20} \times a^3b^3 + \boxed{15} \times a^2b^4 + \boxed{6} \times ab^5 + \boxed{1} \times b^6$$

< 34 ページ. 整関数の微分 1 >

解答

$$\begin{aligned}(x^4)' = f'(x) &= \lim_{h \rightarrow 0} \frac{(x+h)^4 - x^4}{h} \\ &= \lim_{h \rightarrow 0} \frac{x^4 + 4x^3h + 6x^2h^2 + 4xh^3 + h^4 - x^4}{h} \\ &= \lim_{h \rightarrow 0} (4x^3 + 6x^2h + 4xh^2 + h^3) = 4x^3\end{aligned}$$

## < 35 ページ. 整関数の微分 2 >

### 問1の解答

$$\begin{aligned}(x^5)' = f'(x) &= \lim_{h \rightarrow 0} \frac{(x+h)^5 - x^5}{h} \\ &= \lim_{h \rightarrow 0} \frac{x^5 + 5x^4h + 10x^3h^2 + 10x^2h^3 + 5xh^4 + h^5 - x^5}{h} \\ &= \lim_{h \rightarrow 0} (5x^4 + 10x^3h + 10x^2h^2 + 5xh^3 + h^4) = 5x^4\end{aligned}$$

### 問2の解答

$$\begin{aligned}(x^6)' = f'(x) &= \lim_{h \rightarrow 0} \frac{(x+h)^6 - x^6}{h} \\ &= \lim_{h \rightarrow 0} \frac{x^6 + 6x^5h + 15x^4h^2 + 20x^3h^3 + 15x^2h^4 + 6xh^5 + h^6 - x^6}{h} \\ &= \lim_{h \rightarrow 0} (6x^5 + 15x^4h + 20x^3h^2 + 15x^2h^3 + 6xh^4 + h^5) = 6x^5\end{aligned}$$

### 問3の解答

元の関数 $f(x)$	$x^0$	$x^1$	$x^2$	$x^3$	$x^4$	$x^5$	$x^6$
導関数 $f'(x)$	0	1	$2x$	$3x^2$	$4x^3$	$5x^4$	$6x^5$

### 問4の解答

$$(x^n)' = nx^{n-1}$$

< 36 ページ. 整関数の微分 3 >

解答

$$(1) \quad (x^3 - x^5)' \\ = 3x^2 - 5x^4$$

$$(2) \quad (12x^5)' \\ = 60x^4$$

$$(3) \quad (4x^3 + 8x^5)' \\ = 12x^2 + 40x^4$$

$$(4) \quad (7x^6 - 3x^4 + 5)' \\ = 42x^5 - 12x^3$$

$$(5) \quad (10x^4 - 5x^3 + 16)' \\ = 40x^3 - 15x^2$$

$$(6) \quad (4x^6 - 7x^4 + 8x^3 - 9x)' \\ = 24x^5 - 28x^3 + 24x^2 - 9$$

$$(7) \quad ((x-2)(x+3))' \\ = (x^2 + x - 6)' \\ = 2x + 1$$

$$(8) \quad ((x^2-4)(x^2-5))' \\ = (x^4 - 9x^2 + 20)' \\ = 4x^3 - 18x$$

< 37 ページ. 極大・極小 1 >

解答

$$\underline{x = 0 \quad \text{のとき極大値 } y = 0}$$

$$\underline{x = 2 \quad \text{のとき極小値 } y = -4}$$

$x$	...	0	...	2	...
$y'$	+	0	-	0	+
$y$	↗	0	↘	-4	↗

< 38 ページ. 極大・極小 2 >

解答

(1)  $y = x^4 - 2x^2 + 3$   
 $y' = 4x^3 - 4x = 4x(x^2 - 1)$   
 $x = 0$  の時極大値  $y = 3$   
 $x = \pm 1$  の時極小値  $y = 2$

$x$	...	-1	...	0	...	1	...	
$y'$	-	0	+	0	-	0	+	
$y$		↘	2	↗	3	↘	2	↗

(2)  $y = -3x^4 + 4x^3 + 12x^2$   
 $y' = -12x^3 + 12x^2 + 24x$   
 $= -12x(x^2 - x - 2)$   
 $= -12x(x - 2)(x + 1)$   
 $x = 2$  の時極大値  $y = 32$   
 $x = -1$  の時極大値  $y = 5$   
 $x = 0$  の時極小値  $y = 0$

$x$	...	-1	...	0	...	2	...	
$y'$	+	0	-	0	+	0	-	
$y$		↗	5	↘	0	↗	32	↘

< 39 ページ. 分数関数の微分 >

解答

$$\begin{aligned} (1) \quad f'(x) &= \lim_{h \rightarrow 0} \frac{\frac{1}{x+h} - \frac{1}{x}}{h} = \lim_{h \rightarrow 0} \frac{\frac{x-(x+h)}{(x+h)x}}{h} \\ &= \lim_{h \rightarrow 0} \frac{-1}{(x+h)x} = -\frac{1}{x^2} \end{aligned}$$

$$(2) \quad (x^{-1})' = -x^{-2}$$

< 40 ページ. 無理関数の微分 >

解答

$$\begin{aligned}(1) \quad f'(x) &= \lim_{h \rightarrow 0} \frac{\sqrt{x+h} - \sqrt{x}}{h} \\ &= \lim_{h \rightarrow 0} \frac{(\sqrt{x+h} - \sqrt{x}) \times (\sqrt{x+h} + \sqrt{x})}{h \times (\sqrt{x+h} + \sqrt{x})} \\ &= \lim_{h \rightarrow 0} \frac{(x+h) - x}{h(\sqrt{x+h} + \sqrt{x})} \\ &= \lim_{h \rightarrow 0} \frac{h}{h(\sqrt{x+h} + \sqrt{x})} \\ &= \lim_{h \rightarrow 0} \frac{1}{\sqrt{x+h} + \sqrt{x}} \\ &= \frac{1}{2\sqrt{x}}\end{aligned}$$

$$(2) \quad (x^{\frac{1}{2}})' = \frac{1}{2}x^{-\frac{1}{2}}$$