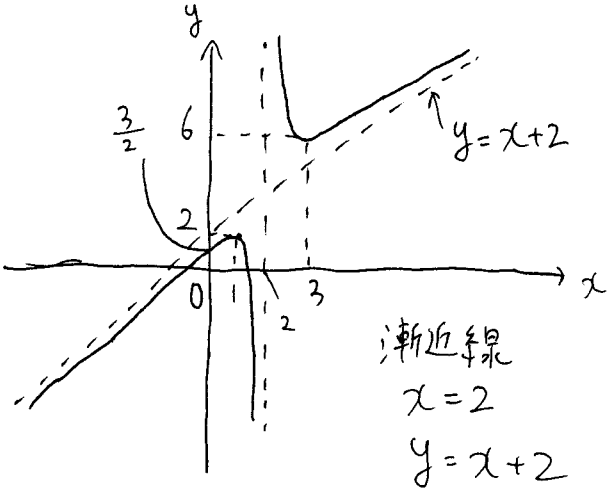
1. (1) $y=\frac{x^2-3}{x-2}=x+2+\frac{1}{x-2}$

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

x	$\cdots$	1	$\cdots$	2	$\cdots$	3	$\cdots$
y'	$+$	0	$-$	$/$	$-$	0	$+$
y''	$-$	$-$	$-$	$/$	$+$	$+$	$+$
y	↗	2	↘	$/$	↳	6	↗

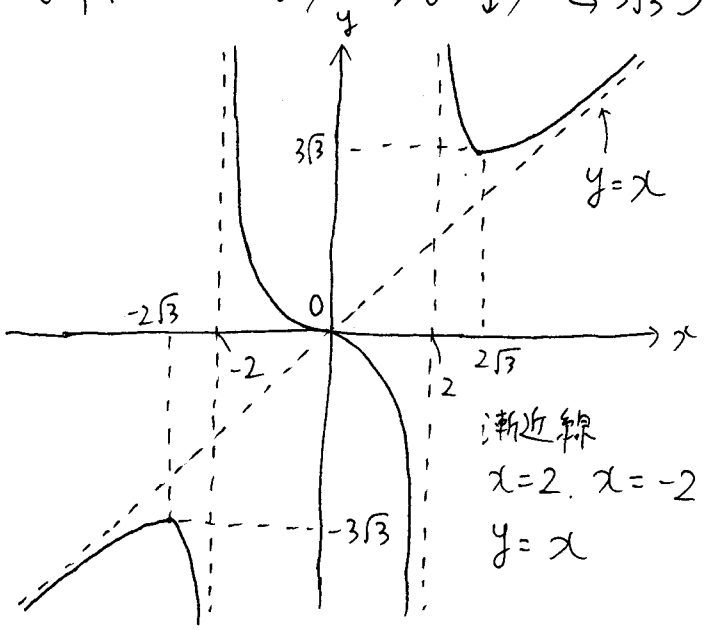


漸近線
$x=2$
$y=x+2$

(2) $y=\frac{x^3}{x^2-4}=x+\frac{4x}{x^2-4}$

$y'=\frac{x^2(x^2-12)}{(x^2-4)^2}$ $y''=\frac{8x(x^2+12)}{(x^2-4)^3}$

x	$\cdots$	$-2\sqrt{3}$	$\cdots$	-2	$\cdots$	0	$\cdots$	2	$\cdots$	$2\sqrt{3}$	$\cdots$
y'	$+$	0	$-$	$/$	$-$	0	$-$	$/$	$-$	0	$+$
y''	$-$	$-$	$-$	$/$	$+$	0	$-$	$/$	$+$	$+$	$+$
y	↗	$-3\sqrt{3}$	↘	$/$	↳	0	↘	$/$	↳	$3\sqrt{3}$	↗

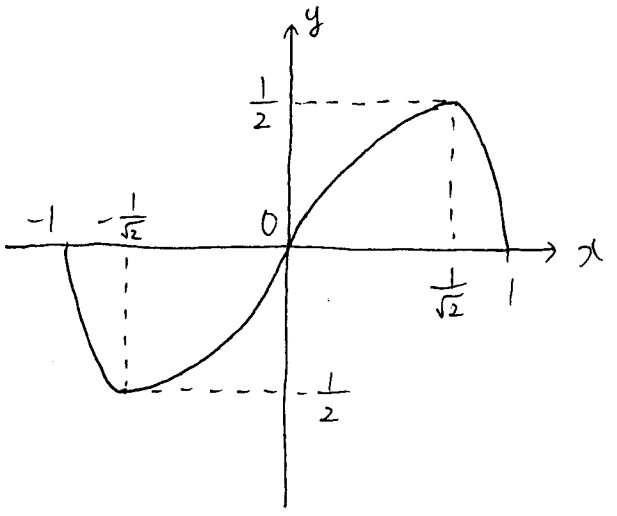


漸近線
$x=2$, $x=-2$
$y=x$

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

$y'=\frac{1-2x^2}{\sqrt{1-x^2}}$ $y''=\frac{2x^3-3x}{(1-x^2)\sqrt{1-x^2}}$

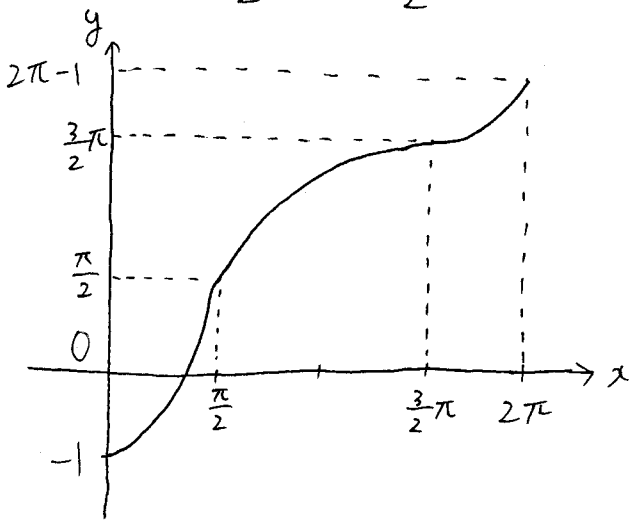
x	-1	$\cdots$	$-\frac{1}{\sqrt{2}}$	$\cdots$	0	$\cdots$	$\frac{1}{\sqrt{2}}$	$\cdots$	1
y'	$/$	$-$	0	$+$	$+$	$+$	0	$-$	$/$
y''	$/$	$+$	$+$	$+$	0	$-$	$-$	$-$	$/$
y	0	↳	$-\frac{1}{2}$	↗	0	↗	$\frac{1}{2}$	↘	0



(4) $y=x-\cos x\ (0\leqq x\leqq 2\pi)$

$y'=1+\sin x$ $y''=\cos x$

x	0	$\cdots$	$\frac{\pi}{2}$	$\cdots$	$\frac{3}{2}\pi$	$\cdots$	2π
y'	$/$	$+$	$+$	$+$	0	$+$	$/$
y''	$/$	$+$	0	$-$	0	$+$	$/$
y	-1	↗	$\frac{\pi}{2}$	↗	$\frac{3}{2}\pi$	↗	$2\pi-1$



(5) $y = e^{\frac{1}{x}}$

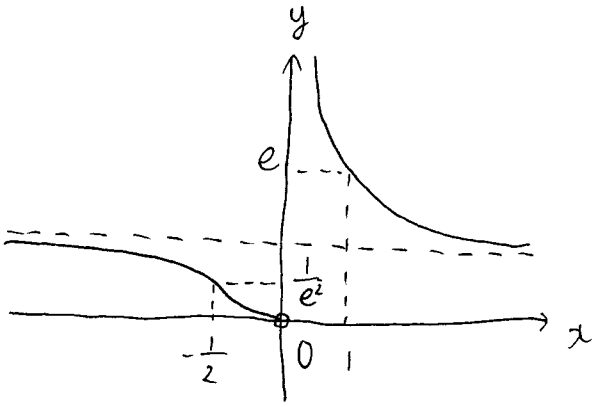
$y' = -\dfrac{e^{\frac{1}{x}}}{x^2}$　$y'' = \dfrac{e^{\frac{1}{x}}(1+2x)}{x^4}$

x	$\cdots$	$-\frac{1}{2}$	$\cdots$	0	$\cdots$
y'	$-$	$-$	$-$	/	$-$
y''	$-$	0	$+$	/	$+$
y	↘	$\frac{1}{e^2}$	↘	/	↘

$t = -\frac{1}{x}$ とおくと

$\lim_{x \to \pm\infty} e^{\frac{1}{x}} = e^0 = 1$　（$x \to -0$ のとき $t \to \infty$）

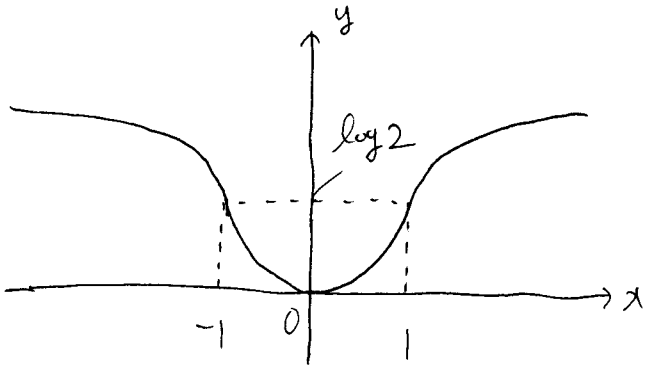
$\lim_{x \to +0} e^{\frac{1}{x}} = \infty$　$\lim_{x \to -0} e^{\frac{1}{x}} = 0$



(6) $y = \log(x^2+1)$

$y' = \dfrac{2x}{x^2+1}$　$y'' = \dfrac{-2(x+1)(x-1)}{(x^2+1)^2}$

x	$\cdots$	-1	$\cdots$	0	$\cdots$	1	$\cdots$
y'	$-$	$-$	$-$	0	$+$	$+$	$+$
y''	$-$	0	$+$	$+$	$+$	0	$-$
y	↘	$\log 2$	↘	0	↗	$\log 2$	↗



2. $y' = 3x^2 + 6ax + 3b$

$y'' = 6x + 6a$　$y = f(x)$ とすると

$f'(1) = 0$ より　$3 + 6a + 3b = 0$ …①

$f''(0) = 0$ より　$6a = 0$　$\underline{a = 0}$

$f(0) = 3$ より　$\underline{c = 3}$

① より　$\underline{b = -1}$

よって

$\underline{a = 0,\ b = -1,\ c = 3}$

3. $f(x) = ax^4 + bx^3 + cx^2 + dx + e$ とする.

$f'(x) = 4ax^3 + 3bx^2 + 2cx + d$

$f''(x) = 12ax^2 + 6bx + 2c$

$f''(-1) = 0$ より　$12a - 6b + 2c = 0$ …①

$f''(1) = 0$ より　$12a + 6b + 2c = 0$ …②

$f'(1) = 1$ より　$4a + 3b + 2c + d = 1$ …③

$f(1) = 8$ より　$a + b + c + d + e = 8$ …④

$f(-1) = 1$ より　$a - b + c - d + e = 1$ …⑤

①, ② より　$b = 0$.

④, ⑤ より　$d = \frac{7}{2}$

①, ③ より　$a = \frac{5}{16}$, $c = -\frac{15}{8}$

⑤ より　$e = \frac{97}{16}$

よって.

$\underline{f(x) = \frac{5}{16}x^4 - \frac{15}{8}x^2 + \frac{7}{2}x + \frac{97}{16}}$