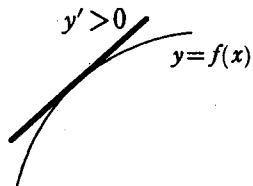
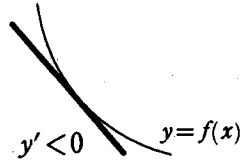


2. 関数の増減



曲線が右上がり  $\Leftrightarrow y' > 0$   
(接線の傾きが正)



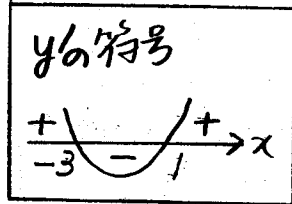
曲線が右下がり  $\Leftrightarrow y' < 0$   
(接線の傾きが負)

$y'$  の正負で、グラフの増減が判定できる。

1 次の関数の極値を求めよ。また、そのグラフをかけ。

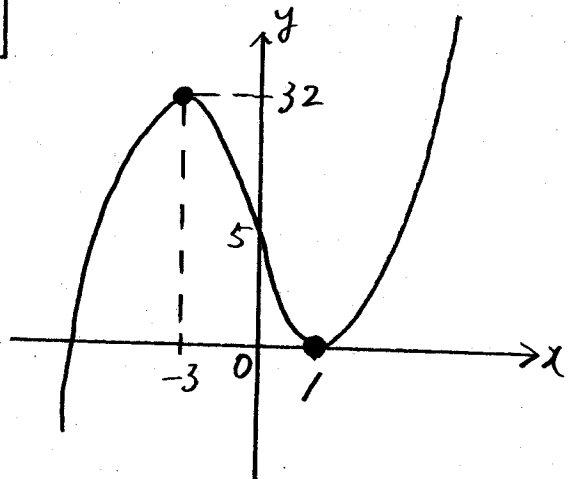
(1)  $y = x^3 + 3x^2 - 9x + 5$

$$\begin{aligned} y' &= 3x^2 + 6x - 9 \\ &= 3(x^2 + 2x - 3) \\ &= 3(x+3)(x-1) \end{aligned}$$



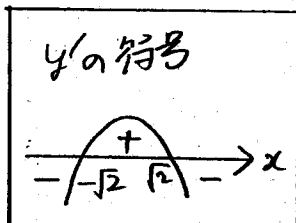
$x$	$\dots$	$-3$	$\dots$	$1$	$\dots$
$y'$	$+$	$0$	$-$	$0$	$+$
$y$	$\nearrow$	$32$	$\searrow$	$0$	$\nearrow$

極大値  $32$  ( $x = -3$ )  
極小値  $0$  ( $x = 1$ )



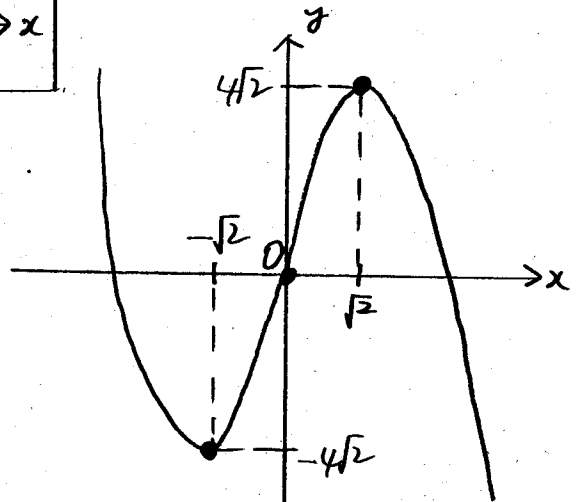
(2)  $y = -x^3 + 6x$

$$\begin{aligned} y' &= -3x^2 + 6 \\ &= -3(x^2 - 2) \\ &= -3(x + \sqrt{2})(x - \sqrt{2}) \end{aligned}$$



$x$	$\dots$	$-\sqrt{2}$	$\dots$	$\sqrt{2}$	$\dots$
$y'$	$-$	$0$	$+$	$0$	$-$
$y$	$\searrow$	$-4\sqrt{2}$	$\nearrow$	$4\sqrt{2}$	$\searrow$

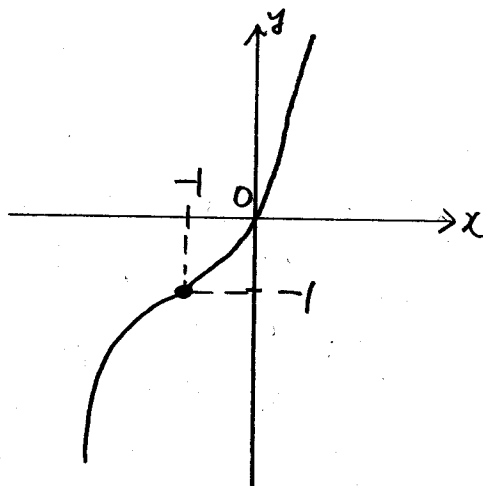
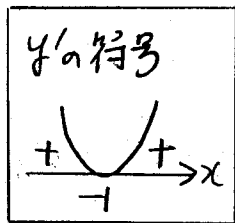
極大値  $4\sqrt{2}$  ( $x = \sqrt{2}$ )  
極小値  $-4\sqrt{2}$  ( $x = -\sqrt{2}$ )



2 次の関数のグラフをかけ。

$$y = x^3 + 3x^2 + 3x$$

$$\begin{aligned} y' &= 3x^2 + 6x + 3 \\ &= 3(x^2 + 2x + 1) \\ &= 3(x+1)^2 \end{aligned}$$

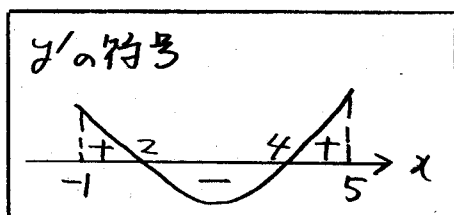


x	...	-1	...
y'	+	0	+
y	↗	-1	↗

3 次の関数の最大値と最小値を求めよ。

(1)  $y = x^3 - 9x^2 + 24x$  ( $-1 \leq x \leq 5$ )

$$\begin{aligned} y' &= 3x^2 - 18x + 24 \\ &= 3(x^2 - 6x + 8) \\ &= 3(x-2)(x-4) \end{aligned}$$

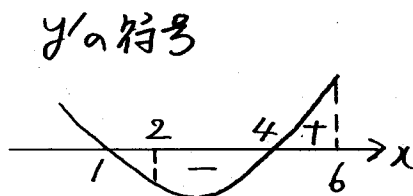


x	-1	...	2	...	4	...	5
y'		+	0	-	0	+	
y	-34	↗	20	↘	16	↗	20

$$\begin{cases} \text{Max } 20 & (x=2, 5) \\ \text{Min } -34 & (x=-1) \end{cases}$$

(2)  $y = 2x^3 - 15x^2 + 24x + 4$  ( $2 \leq x \leq 6$ )

$$\begin{aligned} y' &= 6x^2 - 30x + 24 \\ &= 6(x^2 - 5x + 4) \\ &= 6(x-1)(x-4) \end{aligned}$$



x	2	...	4	...	6
y'		-	0	+	
y	8	↘	-12	↗	40

$$\begin{cases} \text{Max } 40 & (x=6) \\ \text{Min } -12 & (x=4) \end{cases}$$