

学籍番号 名前

Ex. 1 以下の関数を x について微分せよ.

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

$$f'(x) = 6x^2 + 6x + 1$$

2. $f(x) = -2x + 3$

$$f'(x) = -2$$

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

$$f'(x) = 2x - 2$$

4. $f(x) = -18$

$$f'(x) = 0$$

5. $f(x) = (1/2)x^2 + 5$

$$f'(x) = x$$

Ex. 2 微分を用いて以下の放物線の頂点の座標を求めよ.

軸, 原点の説明, 頂点, 縦軸との接点の座標を必ず書き込むこと.

1. $f(x) = -x^2 + 3x - 2$

$$f'(x) = -2x + 3 = 0 \text{ とおくと}$$

$$x = \frac{3}{2}, f\left(\frac{3}{2}\right) = -\frac{9}{4} + \frac{9}{2} - 2 = \frac{1}{4} \quad (x, y) = \left(\frac{3}{2}, \frac{1}{4}\right)$$

2. $f(x) = 4x^2 + 4x + 4$

$$f'(x) = 8x + 4 = 0 \text{ とおくと}$$

$$x = -\frac{1}{2}$$

$$f\left(-\frac{1}{2}\right) = 3$$

$$(x, y) = \left(-\frac{1}{2}, 3\right)$$

3. $f(x) = 2x^2 + 4x + 3$

$$f'(x) = 4x + 4 = 0 \text{ とおくと}$$

$$x = -1, f(-1) = 1$$

$$(x, y) = (-1, 1)$$

4. $f(x) = x^3 + 2x^2 + x + 3$

$$f'(x) = 3x^2 + 4x + 1 = 0 \text{ とおくと}$$

$$(3x+1)(x+1) = 0$$

$$x = -\frac{1}{3}, -1$$

$$f\left(-\frac{1}{3}\right) = \frac{27}{27}, f(-1) = 3$$

$$(x, y) = \left(-1, 3\right), \left(-\frac{1}{3}, \frac{27}{27}\right)$$

Ex. 3 以下の曲線の与えられた x の時の傾きを求めよ.

1. $f(x) = -2x^2 + x - 2, (x=0)$

$$f'(x) = -4x + 1 \quad f'(0) = 1$$

2. $f(x) = x^2 + 2, (x=4)$

$$f'(x) = 2x \quad f'(4) = 8$$

3. $f(x) = x^3 + 3x^2 + x - 5, (x=-1)$

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

Ex. 4 次の曲線の, 与えられた点における接線の方程式を求めよ.

1. $f(x) = 2x^3, (x, y) = (1, 2)$

$$f'(x) = 6x^2, f'(1) = 6$$

$$2 = 6x + b$$

$$b = -4$$

接線を $y = 6x + b$ とおくと.

またこの接線は $(x, y) = (1, 2)$ を通るので, $\therefore y = 6x - 4$

2. $f(x) = 2x^2 + 7x - 2, (x, y) = (0, -2)$

同様に

$$f'(x) = 4x + 7, f'(0) = 7$$

\therefore

$$y = 7x + b$$

$$y = 7x - 2$$

$$-2 = 7 \times 0 + b$$

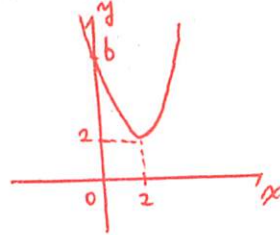
$$b = -2$$

Ex. 5 微分を用いて以下の2次関数をグラフに示せ。
 軸, 原点の説明, 頂点, 縦軸との接点の座標を必ず書き込むこと。

1. $y = x^2 - 4x + 6$

$y' = 2x - 4 = 0$ とおくと
 $x = 2$, 代入して y をとる。

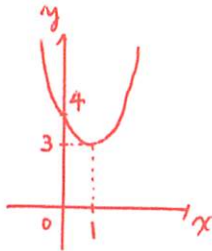
$y = 4 - 8 + 6 = 2$
 $(x, y) = (2, 2)$



2. $y = x^2 - 2x + 4$

$y' = 2x - 2 = 0$ とおくと
 $x = 1$

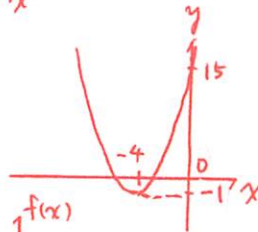
$y = 1 - 2 + 4 = 3$
 $(x, y) = (1, 3)$



3. $y = x^2 + 8x + 15$

$y' = 2x + 8 = 0$ とおくと
 $x = -4$

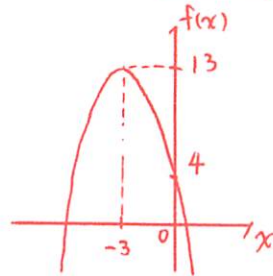
$y = -1$
 $(x, y) = (-4, -1)$



4. $f(x) = -x^2 - 6x + 4$

$f'(x) = -2x - 6 = 0$ とおくと
 $x = -3$

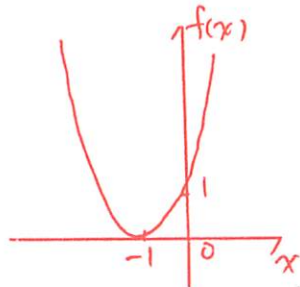
$f(-3) = 13$
 $(x, f(x)) = (-3, 13)$



5. $f(x) = x^2 + 2x + 1$

$f'(x) = 2x + 2 = 0$ とおくと
 $x = -1$

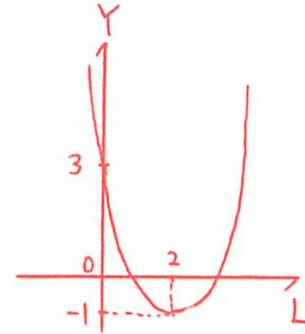
$f(-1) = 0$
 $(x, f(x)) = (-1, 0)$



6. $Y = L^2 - 4L + 3$

$Y' = 2L - 4 = 0$ とおくと
 $L = 2$

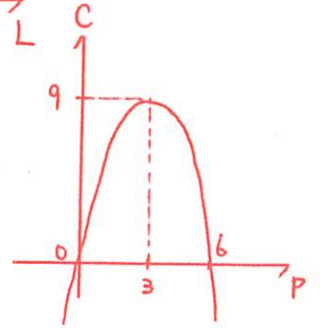
$Y = -1$
 $(L, Y) = (2, -1)$



7. $C = -P^2 + 6P$

$C' = -2P + 6 = 0$ とおくと
 $P = 3$

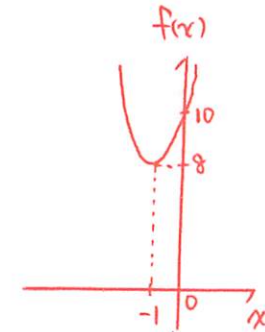
$C = 9$
 $(P, C) = (3, 9)$



8. $f(x) = 2x^2 + 4x + 10$

$f'(x) = 4x + 4 = 0$ とおくと
 $x = -1$

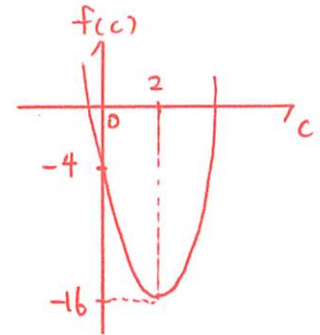
$f(-1) = 8$
 $(x, f(x)) = (-1, 8)$



9. $f(C) = 3C^2 - 12C - 4$

$f'(C) = 6C - 12 = 0$ とおくと
 $C = 2$

$f(2) = -16$
 $(C, f(C)) = (2, -16)$



10. $f(x) = \frac{1}{8}x^2 + 10x + 5$

$f'(x) = \frac{1}{4}x + 10 = 0$ とおくと
 $x = -40$

4 $f(-40) = -195$
 $(x, f(x)) = (-40, -195)$

