

#### 4.1절 확인문제

01. 거짓

02. -1

03. 2

04. (a) 3                      (b)  $4x - 3$

05. 미분가능하지 않으며, 연속이 아니다.

## 4.2절 확인문제

01. 참

02.

(a)  $y' = (2x+2)(2x^3-2x^2+1) + (x^2+2x-1)(6x^2-4x) = 10x^4 + 8x^3 - 18x^2 + 6x + 2$

(b)  $y' = \frac{2x(x^3+3x-1) - (x^2-2)(3x^2+3)}{(x^3+3x-1)^2} = \frac{-x^4+9x^2-2x+6}{(x^3+3x-1)^2}$

(c)  $y' = 4x^3 + \frac{1}{x^2}$

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

03.  $\tan(\alpha - \beta) = \frac{3\sqrt{3}+4}{3-4\sqrt{3}}$

04. (a)  $\frac{1}{2}$       (b)  $e^{-\frac{1}{3}}$

05.

(a)  $f'(x) = -2\sin x - \sec^2 x$

(b)  $g'(x) = e^x \log x + e^x \frac{1}{x} = e^x \left( \log x + \frac{1}{x} \right)$

#### 4.3절 확인문제

01. 거짓

02.

$$(a) f'(x) = \frac{1}{x+1}, f''(x) = \frac{d}{dx} f'(x) = -\frac{1}{(x+1)^2}$$

$$(b) g'(x) = 3x^2 - 6x, g''(x) = 6x - 6$$

$$03. (a) f'''(x) = 24 \quad (b) g'''(x) = \frac{24}{x^5}$$

#### 4.4절 확인문제

01. 거짓

02.

(a)  $f'(x) = 2(x^3 - 2x)(3x^2 - 2) = 6x^5 - 16x^3 + 8x$

(b)  $f'(x) = e^{x^2} \cdot 2x = 2xe^{x^2}$

(c)  $f'(x) = 2\sin x \cos x \cdot \cos x + \sin^2 x (-\sin x) = 2\sin x \cos^2 x - \sin^3 x$

03.  $g'(2) = \frac{1}{3}$

#### 4.5절 확인문제

01. 참

02.  $\frac{dy}{dx} = \frac{4x - y}{x - 6y - 2}$

03. (a)  $\frac{dy}{dx} = -2t(t+1)^2 = \frac{-2(1-x)}{x^3}$       (b)  $\frac{dy}{dx} = \frac{-\sin t}{2e^{2t}}$

#### 4.6절 확인문제

01. 참

02. 생략

03. (a) 1                      (b) 0

#### 4.7절 확인문제

01. (a)  $y = \frac{2}{e^2}x + \frac{3}{e^2}$       (b)  $y = 10x - 7$

02.  $y = x + 1$

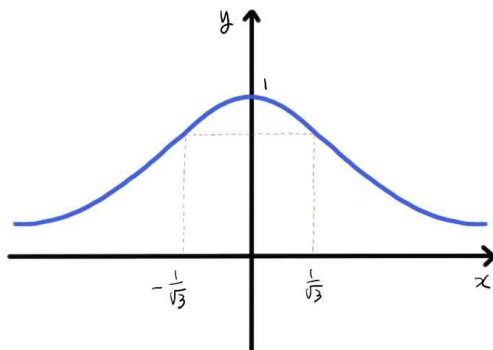
03.  $y = \frac{1}{e}x$

04. (a) 극솟값  $-\frac{9}{4}$       (b) 극솟값  $-\frac{1}{2e}$

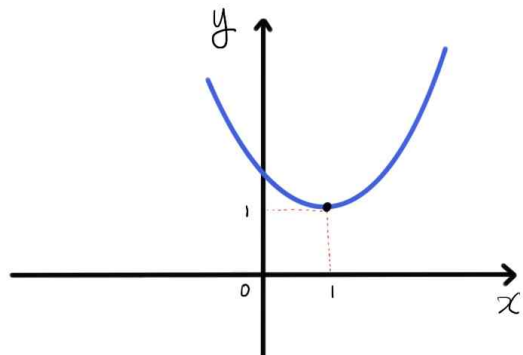
05. 최댓값은 3, 최솟값은  $-24$

06.

(a)



(b)



## 4장 연습문제

01. 14

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

03. 98

04. (a) 미분가능하지 않고, 연속이 아니다. (b) 미분가능하지 않고, 연속이 아니다.

05.  $a = 1, b = 15$

06. 생략

07. (a)  $\frac{4}{3}$       (b)  $\frac{1}{2}$       (c)  $\frac{3}{2}$       (d)  $\frac{5}{3}$

08.  $a = 1$

09. 생략

10.

(a)  $\frac{dy}{dx} = 4(2x-1)^3 \cdot 2 = 8(2x-1)^3$

(b)  $\frac{dy}{dx} = \frac{-(-3x^2)}{(3-x^3)^2} = \frac{3x^2}{(3-x^3)^2}$

(c)  $\frac{dy}{dx} = \frac{1}{\tan x} \frac{d}{dx}(\tan x) = \frac{\sec^2 x}{\tan x} = \frac{1}{\sin x \cos x}$

(d)  $\frac{dy}{dx} = e^{\sqrt{x}} \frac{d}{dx}(\sqrt{x}) = \frac{e^{\sqrt{x}}}{2\sqrt{x}}$

```
import sympy as sp
x = sp.Symbol('x')
# (a)
fx = (2*x-1)**4
print("The answer for (a) is ", sp.diff(fx,x))
# (b)
fx = 1/(3-x**3)
print("The answer for (b) is ", sp.diff(fx,x))
```



```
# (c)
fx = sp.log(sp.tan(x))
print("The answer for (c) is ", sp.diff(fx,x))
# (d)
fx = sp.exp(sp.sqrt(x))
print("The answer for (d) is ", sp.diff(fx,x))
```

11.  $k = -4$

```
import sympy as sp
x = sp.Symbol('x')
fx = sp.exp(2*x)*sp.sin(3*x)
dfx = sp.diff(fx,x)
ddfx = sp.diff(sp.diff(fx,x),x)
k = sp.Symbol('k')
print(sp.factor(ddfx+k*dfx+13*fx)) # sp.factor 는 인수분해!
```

12. (a)  $y = 3ex - 4e$       (b)  $y = \frac{1}{8}x + \frac{9}{8}$

13. (a)  $y = \frac{1}{4}x + 1$       (b)  $y = \frac{1}{e^2}x + 1$

14. (a) 극솟값  $2 - e^2$       (b) 극댓값 1

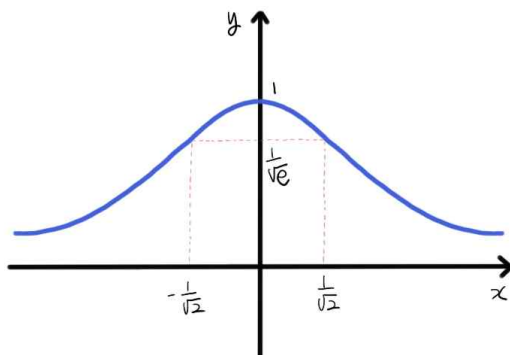
15.  $r = \sqrt[3]{\frac{9}{2}}$ ,  $h = 3\sqrt[3]{\frac{4}{3}}$

16. (a)  $x < -1$ ,  $x > 1$  일 때 아래로 볼록이고,  $-1 < x < 1$  일 때 위로 볼록,  
변곡점은  $\left(-1, \frac{1}{4}\right)$ ,  $\left(1, \frac{1}{4}\right)$   
(b)  $x > 0$  일 때 아래로 볼록, 변곡점은 없다.

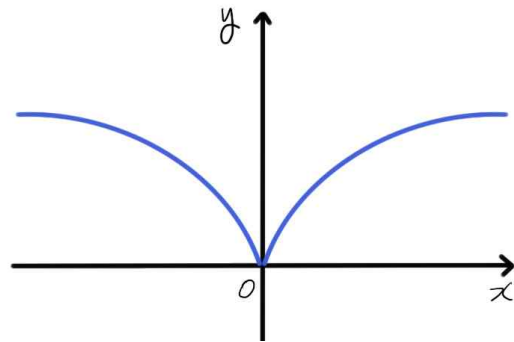
17.

```
import numpy as np
import matplotlib.pyplot as plt
# (a)  $f(x)=e^{-x^2}$ 
x = np.linspace(-2,2,401)
fx = np.exp(-x*x)
plt.plot(x,fx)
plt.show()
# (b)  $g(x)=x^{2/3}$ 
x = np.linspace(-4,4,801)
gx = (x**2)**(1/3)
plt.plot(x,gx)
plt.show()
```

(a)



(b)



18. (a) 없다. (b) 2개

19.  $1 < a < 2$

20.  $3e$