

5.1절 확인문제

01. (a) $\int 2x dx = x^2 + C$ (b) $\int \frac{1}{x} dx = \log x + C$

02. (a) $\int (2x^3 - 5x + 1) dx = \frac{1}{2}x^4 - \frac{5}{2}x^2 + x + C$

(b) $\int (x^5 - 4x^3 + x) dx = \frac{1}{6}x^6 - x^4 + \frac{1}{2}x^2 + C$

03. $f(x) = \frac{1}{2}x^4 + \frac{3}{2}x^2 - x$

5.2절 확인문제

01. (a) $\int \left(x^2 - \frac{1}{x^3} \right) dx = \frac{1}{3} x^3 + \frac{1}{2} x^{-2} + C$ (b) $\int (\sqrt[3]{x} + \sqrt[4]{x}) dx = \frac{3}{4} x^{\frac{4}{3}} + \frac{4}{5} x^{\frac{5}{4}} + C$

02. (a) $\int (\sin x - \cos x) dx = -\cos x - \sin x + C$ (b) $\int \frac{2\cos^2 x}{1 - \sin x} dx = 2x - 2\cos x + C$

03. (a) $\int (e^x + 2^{x+3}) dx = e^x + \frac{2^{x+3}}{\log 2} + C$ (b) $\int \frac{e^{2x} - x^2}{e^x - x} dx = e^x + \frac{1}{2} x^2 + C$

5.3절 확인문제

01. (a) $\int \frac{1}{(2x-1)^4} dx = -\frac{1}{6}(2x-1)^{-3} + C$

(b) $\int e^{7x+1} dx = \frac{1}{7}e^{7x+1} + C$

02. (a) $\int x(x^2+1)^3 dx = \frac{1}{8}(x^2+1)^4 + C$

(b) $\int \sin^2 x \cos x dx = \frac{1}{3} \sin^3 x + C$

03. (a) $\int \frac{e^{2x} - e^{-2x}}{e^{2x} + e^{-2x}} dx = \frac{1}{2} \log |e^{2x} + e^{-2x}| + C$

(b) $\int \frac{3x^2 - 4}{x^3 - 4x + 1} dx = \log |x^3 - 4x + 1| + C$

5.4절 확인문제

01. 참

02. (a) $\int x \sin x dx = -x \cos x + \sin x + C$

(b) $\int x^2 \log x dx = \frac{1}{3}x^3 \log x - \frac{1}{9}x^3 + C$

03. $\int e^x \cos x dx = \frac{1}{2}e^x(\cos x + \sin x)$

5.5절 확인문제

01. 참

02. 4

03. (a) 10 (b) 0

04. $f(x) = \frac{1}{x} + 1$, $a = -1$

05. (a) $\frac{3}{2}$ (b) 1

5.6절 확인문제

01. 거짓

02. $e - 1$

03. (a) $\frac{1}{6}$ (b) $\frac{1}{6}$

04. 25 cm^3

05. (a) $\frac{1}{7}\pi$ (b) $\frac{32}{5}\pi$

5장 연습문제

01.

$$(a) \int (x^3 - 3x + 2)dx = \frac{1}{4}x^4 - \frac{3}{2}x^2 + 2x + C$$

$$(b) \int \left(e^x - \frac{1}{x}\right)dx = e^x - \log x + C$$

$$(c) \int (x+1)^2(x-2)dx = \frac{1}{4}x^4 - \frac{3}{2}x^2 - 2x + C$$

$$(d) \int (3^x - 1)^2 dx = \frac{3^{2x}}{2\log 3} - 2\frac{3^x}{\log 3} + x + C$$

$$(e) \int \sin^3 x dx = -\cos x + \frac{1}{3}\cos^3 x + C$$

$$(f) \int x^2 \log x dx = \frac{1}{3}x^3 \log x - \frac{1}{9}x^3 + C$$

```
import sympy as sp
x = sp.Symbol('x')

# (a)
fx = x**3-3*x+2
print("F(x)=",sp.integrate(fx,x))

# (b)
fx = sp.exp(x)-1/x
print("F(x)=",sp.integrate(fx,x))

# (c)
fx = ((x+1)**2)*(x-2)
print("F(x)=",sp.integrate(fx,x))

# (d)
fx = (3**x-1)**2
print("F(x)=",sp.integrate(fx,x))

# (e)
fx = (sp.sin(x))**3
print("F(x)=",sp.integrate(fx,x))
```

```
# (f)
fx = (x**2)*sp.log(x)
print("F(x)=",sp.integrate(fx,x))
```

02. $f(-1) = 4e^{-1} + 1$

03. $f(x) = -4x^3 + 3x^2 + 5$

04. (a) $\int \frac{1}{x(x+1)} dx = \log \left| \frac{x}{x+1} \right| + C$
 (b) $\int \frac{2x-3}{x^2-3x+2} dx = \log |x^2-3x+2| + C$

```
import sympy as sp
x = sp.Symbol('x')

# (a)
fx = 1/(x*(x+1))
print("F(x)=",sp.integrate(fx,x))

# (b)
fx = (2*x-3)/(x**2-3*x+2)
print("F(x)=",sp.integrate(fx,x))
```

05. $f(x) = \frac{1}{3}(-\cos x + \sin x) + \frac{2}{3}$, $g(x) = \frac{1}{3}(-2\cos x - \sin x) + \frac{1}{3}$

06. (a) $e^2 - 3$ (b) 4 (c) $\frac{1}{3}(11\sqrt{11} - 3\sqrt{3})$ (d) $\frac{1}{2}(e^{\frac{\pi}{2}} + 1)$

```
import sympy as sp
x = sp.Symbol('x')

# (a)
fx = (sp.exp(2*x)-1)/(sp.exp(x)+1)
print("The answer is ",sp.integrate(fx,(x,0,2)))
```



```
# (b)
fx = sp.Abs(sp.sin(x))
print("The answer is ",sp.integrate(fx,(x,-sp.pi,sp.pi)))

# (c)
fx = x*sp.sqrt(x**2+2)
print("The answer is ",sp.integrate(fx,(x,1,3)))

# (d)
fx = sp.exp(x)*sp.sin(x)
print("The answer is ",sp.integrate(fx,(x,0,sp.pi/2)))
```

07. $f(5)=30$

08. $\lim_{h \rightarrow 0} \frac{1}{h} \int_2^{2+h} f(t) dt = f(2) = e^4 + 4 \log 2$

09. $M+m=12$

10. 생략

11. 생략

```
import sympy as sp

x = sp.Symbol('x')
a = sp.Symbol('a')
alpha = sp.Symbol('alpha')
beta = sp.Symbol('beta')

fx = a*(x-alpha)*(x-beta)
print("The answer is ", sp.factor(sp.integrate(fx,(x,alpha,beta))))
```

12. (a), (b) 생략 (c) 0

13. $\frac{\pi}{4}$

```
import sympy as sp

x = sp.Symbol('x')

fx = sp.sqrt(1-x**2)
print("The answer is ", sp.integrate(fx,(x,0,1)))
```

14. $\frac{12}{7}$

15. (a) 2 (b) $e - e^{-2} + 6$

16. $\frac{1}{2}e^2 - \frac{1}{2}$

17. $a = \frac{1}{4}$

18. (a) $\frac{3}{2}e^2 - e^{-1} + \frac{1}{2}e^{-4} - 1$ (b) $\frac{1}{6}$

19. $4\pi^2$