

(ex. 1)

$$F(x) = \frac{1}{3}x^3 + C$$

$$F(x)$$

$$f(x) = F'(x)$$

$$F'(x) = f(x) = x^2$$

Defn 1.1

$$\int \underbrace{f(x)}_{\text{integrand}} dx = F(x) + C$$

(ex. 3)

$$\int t^5 dt = \frac{t^6}{6} + C$$

$$= \frac{1}{6}t^6 + C \quad \swarrow$$

(thm 1.2)

 $r \neq -1$

$$\int x^r dx = \frac{x^{r+1}}{r+1} + C$$

(ex 4)

$$\int x^{17} dx = \frac{x^{18}}{18} + C$$

$$= \frac{1}{18}x^{18} + C$$

$$\textcircled{\text{ex. 5}} \quad \int \frac{1}{x^3} dx = \int x^{-3} dx = \frac{x^{-2}}{-2} + C$$
$$= -\frac{1}{2} x^{-2} + C$$

$$\textcircled{\text{ex. 6}} \quad \int \sqrt{x} dx = \int x^{1/2} dx = \frac{x^{3/2}}{3/2} + C$$
$$= \frac{2}{3} x^{3/2} + C$$

$$\int \cos x dx = \sin x + C$$

$$\int \sin x dx = -\cos x + C$$

Thm 1.3 $\int [af(x) + bg(x)]dx = a \int f(x)dx + b \int g(x)dx$

(ex. 7) $\int (3\cos x + 4x^8)dx = 3 \int \cos x dx + 4 \int x^8 dx$
 $= 3\sin x + 4 \frac{x^9}{9} + C$
 $= 3\sin x + \frac{4}{9}x^9 + C$

Thm 1.4
 for $x \neq 0$ $\frac{d}{dx} \ln|x| = \frac{1}{x} = x^{-1}$

Cor. 1.1
 $x \neq 0$ $\int \frac{1}{x} dx = \ln|x| + C$

Cor. 1.2
 $f(x) \neq 0$ $\int \frac{f'(x)}{f(x)} dx = \ln|f(x)| + C$

ex. A $\int \frac{2}{x} dx = 2 \int \frac{1}{x} dx = 2 \ln|x| + C$

ex. B $\int \frac{2x+2}{x^2+2x} dx = \ln|x^2+2x| + C$

(ex. 10) $\int \frac{\sec^2 x}{\tan x} dx = \ln|\tan x| + C$

ex 12 position $s(t)$ Velocity $s'(t) = v(t)$ accel, $s''(t) = v'(t) = a(t)$

Assuming

$$y'(0) = -100 \text{ ft/sec}$$

$$y(0) = 100,000 \text{ ft}$$

$$y'(t) = -32t + C$$

$$y'(0) = -100 = -32(0) + C$$

$$-100 = C$$

$$y(t) = -16t^2 - 100t + C$$

$$y(0) = 100,000 = 16(0)^2 - 100(0) + C$$

$$100,000 = C$$

$$y(t) = -16t^2 - 100t + 100,000$$

$$y'(t) = -32t - 100$$

$$y''(t) = -32 \text{ ft/sec}^2$$

$$\int -32t^0 dt$$

$$-32 \int t^0 dt$$

$$\int (-32t - 100) dt$$

$$-32 \int t dt - 100 \int t^0 dt$$

$$-32 \frac{t^2}{2} - 100 \frac{t^1}{1}$$

p. 352-353

5-31 odd, 39-49 odd, 63, 65