# Ch. 8 Review Answer Key

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

b) $\int e^{9x}\,dx = \frac{e^{9x}}{9} + C$

c) $\int 3\sin 6x\,dx$

$= 3\int \sin 6x\,dx = 3\left[-\frac{\cos 6x}{6}\right] + C$

$= -\frac{1}{2}\cos 6x + C$

d) $\int -\frac{2}{3}\cos 2x\,dx = -\frac{2}{3}\int \cos 2x\,dx$

$= -\frac{2}{3}\left[\frac{\sin 2x}{2}\right] + C$

$= -\frac{1}{3}\sin 2x + C$

e) $\int \frac{8}{x}\,dx = 8\int \frac{1}{x}\,dx = 8\ln|x| + C$

g) $\int \cos 3x\,dx = \frac{\sin 3x}{3} + C$

i) $\int \sin \frac{1}{2}x\,dx$

$= \frac{-\cos \frac{1}{2}x}{\frac{1}{2}} + C$

$= -2\cos \frac{1}{2}x + C$

k) $\int \frac{x^{10} - 9x^7}{x^5}\,dx = \int (x^5 - 9x^2)\,dx = \frac{x^6}{6} - 3x^3 + C$

p) $\int -6 \cos \frac{1}{2}x \, dx$

$= -6 \int \cos \frac{1}{2}x \, dx$

$= -6 \left[ \frac{\sin \frac{1}{2}x}{\frac{1}{2}} \right] + C$

$= -12 \sin \frac{1}{2}x + C$

q) $\int \left(x - \frac{1}{x}\right) dx$

$= \frac{x^2}{2} - \ln|x| + C$

v) $\int \frac{12}{x^2} \, dx = \int 12x^{-2} \, dx = -12x^{-1} + C$

5a) $\int x^2 \sqrt{x^3-1}\,dx$

let $u = x^3-1$

$du = 3x^2\,dx$

$\frac{1}{3}du = x^2\,dx$

$= \frac{1}{3}\int \sqrt{u}\,du$

$= \frac{1}{3}\int u^{1/2}\,du = \frac{1}{3}\left[\frac{2}{3}u^{3/2} + C\right]$

$= \frac{2}{9}(x^3-1)^{3/2} + C$

b) $\int (2x+3)(x^2+3x+1)^{11}$

let $u = x^2+3x+1$

$du = (2x+3)\,dx$

$= \int u^{11}\,du$

$= \frac{u^{12}}{12} + C = \frac{(x^2+3x+1)^{12}}{12} + C$

c) $\int e^{\cos x} \sin x\,dx = -\int e^u\,du$

let $u = \cos x$

$du = -\sin x\,dx$

$-du = \sin x\,dx$

$= -e^u + C$

$= -e^{\cos x} + C$

e) $\int e^{2x} \cos(e^{2x})\,dx$

let $u = e^{2x}$

$du = 2e^{2x}\,dx$

$\frac{1}{2}du = e^{2x}\,dx$

$= \frac{1}{2}\int \cos u\,du$

$= \frac{1}{2}[\sin u] + C$

$= \frac{1}{2}\sin e^{2x} + C$

g) $\displaystyle\int \frac{\ln x}{x}\,dx$

let $u = \ln x$

$du = \frac{1}{x}\,dx$

$$\int u\,du$$

$$= \frac{u^2}{2} + C$$

$$= \frac{(\ln x)^2}{2} + C$$

k) $\displaystyle\int \sin^2 x \cos x\,dx = \int (\sin x)^2 \cos x\,dx$

let $u = \sin x$

$du = \cos x\,dx$

$$= \int u^2\,du = \frac{u^3}{3} + C = \frac{(\sin x)^3}{3} + C$$

p) $\displaystyle\int \frac{x}{(5x^2+2)^3}\,dx$

let $u = 5x^2 + 2$

$du = 10x\,dx$

$\frac{1}{10}\,du = x\,dx$

$$= \frac{1}{10}\int \frac{du}{u^3} = \frac{1}{10}\int u^{-3}\,du$$

$$= \frac{1}{10}\left[\frac{u^{-2}}{-2}\right] + C$$

$$= -\frac{1}{20}(5x^2+3)^{-2} + C$$

q) $\displaystyle\int 12x\,\sqrt[5]{1-x^2}\,dx$

let $u = 1 - x^2$

$du = -2x\,dx$

$-6\,du = 12x\,dx$

$$= -6\int u^{1/5}\,du$$

$$= -6\left[\frac{u^{6/5}}{6/5}\right] + C$$

$$= -5(1-x^2)^{6/5} + C$$

v) $\int \frac{x}{x^4+2x^2+1}\,dx = \int \frac{x}{(x^2+1)^2}\,dx$

let $u = x^2+1$

$du = 2x\,dx$

$\frac{1}{2}du = x\,dx$

$= \frac{1}{2}\int \frac{1}{u^2}\,du$

$= \frac{1}{2}\int u^{-2}\,du$

$= \frac{1}{2}\left[-u^{-1} + C\right]$

$= -\frac{1}{2}(x^2+1)^{-1} + C$

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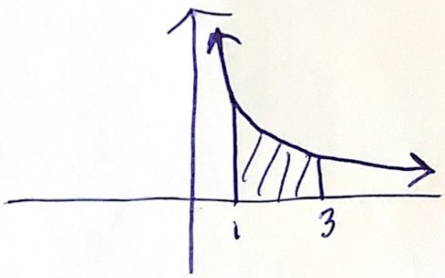
① $y = \dfrac{12}{x^2}$ , $x=1$ , $x=3$



$$\text{Area} = \int_1^3 \frac{12}{x^2}\,dx$$

$$= \int_1^3 12x^{-2}\,dx$$

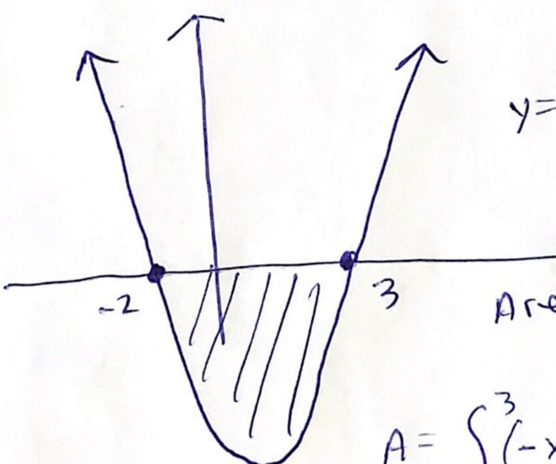
$$= -12x^{-1} \Big|_1^3$$

$$= -\frac{12}{x} \Big|_1^3$$

$$= -\frac{12}{3} - \left(-\frac{12}{1}\right)$$

$$= -4 + 12 = 8$$

②




$y = x^2 - x - 6$ x axis

$$\text{Area} = \int_{-2}^{3} -(x^2 - x - 6)\,dx$$

$$A = \int_{-2}^{3} (-x^2 + x + 6)\,dx$$

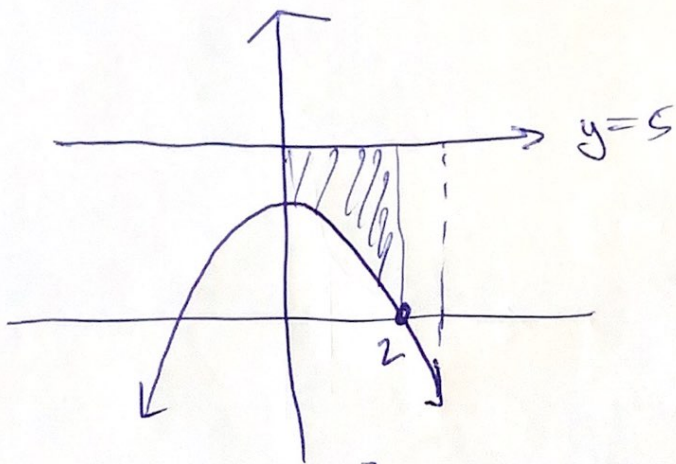
$$= -\frac{x^3}{3} + \frac{x^2}{2} + 6x \Big|_{-2}^{3}$$

$$= \left(-\frac{(3)^3}{3} + \frac{(3)^2}{2} + 6(3)\right) - \left[-\frac{(-2)^3}{3} + \frac{(-2)^2}{2} + 6(-2)\right]$$

$$= -9 + \frac{9}{2} + 18 - \frac{8}{3} - 2 + 12$$

$$= 125/6$$

(3) $y=5$ , $y=4-x^2$ , $x=0$ , $x=3$




$$A = \int_0^3 5-(4-x^2)\,dx = \int_0^3 (5-4+x^2)\,dx$$

$$= \int_0^3 (1+x^2)\,dx$$

$$= x + \frac{x^3}{3}\Big|_0^3 = 3 + \frac{(3)^3}{3}$$

$$= 3 + 9 = 12$$

(6) $y = 11-x^2$ $y = x^2 - \cancel{4}x + 5$

<u>Int. Points</u>

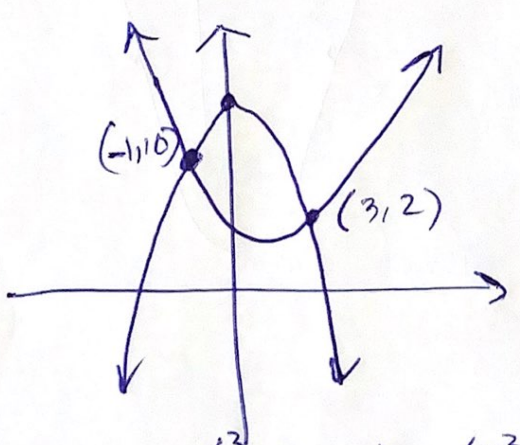
$x^2-4x+5 = 11-x^2$

$2x^2-4x-6=0$

$2(x^2-2x-3)=0$

$2(x-3)(x+1)=0$

$x=3$ or $x=-1$




$$A = \int_{-1}^3 (11-x^2) - (x^2-4x+5)\,dx$$

$$A = \int_{-1}^{3} (11 - x^2 - x^2 + 4x - 5)\, dx$$

$$= \int_{-1}^{3} (6 - 2x^2 + 4x)\, dx$$

$$= 6x - \frac{2}{3}x^3 + 2x^2 \Big|_{-1}^{3}$$

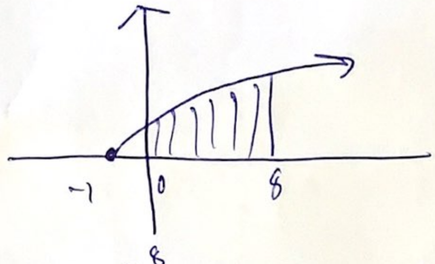
$$= 6(3) - \frac{2}{3}(3)^3 + 2(3)^2 - \left(6(-1) - \frac{2}{3}(-1)^3 + 2(-1)^2\right)$$

$$= 18 - 18 + 18 - \left(-6 + \frac{2}{3} + 2\right)$$

$$= 18 + 6 - \frac{2}{3} - 2$$

$$= \frac{64}{3}$$

(8) $y = \sqrt{x+1}$ $\quad x=0,\ x=8,\ x$ axis



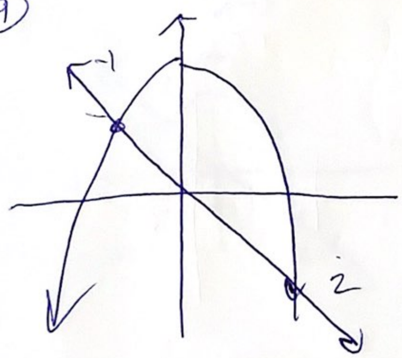

$$\int_0^8 \sqrt{x+1}\, dx \qquad \text{Let } u = x+1,\ du = dx$$

$$\int_1^9 u^{1/2}\, du = \frac{2}{3} u^{3/2} \Big|_1^9$$

$$= \frac{2}{3}(9)^{3/2} - \frac{2}{3}(1)^{3/2}$$

$$= \frac{2}{3}(3)^3 - \frac{2}{3} = 52/3$$

(9)




Int. Points

$$2 - x^2 = -x$$
$$0 = x^2 - x - 2$$
$$0 = (x-2)(x+1)$$
$$x = -1 \text{ or } x = 2$$

$$A = \int_{-1}^{2} 2 - x^2 - (-x)\, dx$$

$$= \int_{-1}^{2} (2 - x^2 + x)\, dx$$

$$= 2x - \frac{x^3}{3} + \frac{x^2}{2} \Big|_{-1}^{2}$$

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

$$= 4 - \frac{8}{3} + 2 - \left(-2 + \frac{1}{3} + \frac{1}{2}\right)$$

$$= 6 - \frac{8}{3} + 2 - \frac{1}{3} - \frac{1}{2}$$

$$= \frac{9}{2}$$