HW (6.1) p.413 #1-6: all ; #13-23 : odd
(use calc for #19)

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#1

$$A = \int_0^6 [0 - (x^2 - 6x)]\,dx$$

$$= -\int_0^6 (x^2 - 6x)\,dx$$

#3

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

$$= \int_0^3 (-2x^2+6x)\,dx$$

#2

$$A = \int_{-2}^{2} [(2x+5) - (x^2+2x+1)]\,dx$$

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

#4

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

#5

$$A = 2\int_{-1}^{0} 3(x^3 - x)\,dx$$

$$= 6\int_{-1}^{0} (x^3 - x)\,dx$$

OR

$$= -6\int_0^1 (x^3 - x)\,dx$$

#6

$$A = 2\int_0^1 [(x-1)^3 - (x-1)]\,dx$$

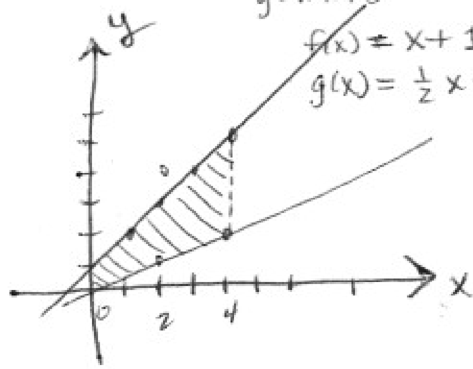
#7

$$\int_0^4 \left[(x+1) - \frac{x}{2}\right]dx$$

y = mx + b

$f(x) = x + 1$

$g(x) = \frac{1}{2}x + 0$



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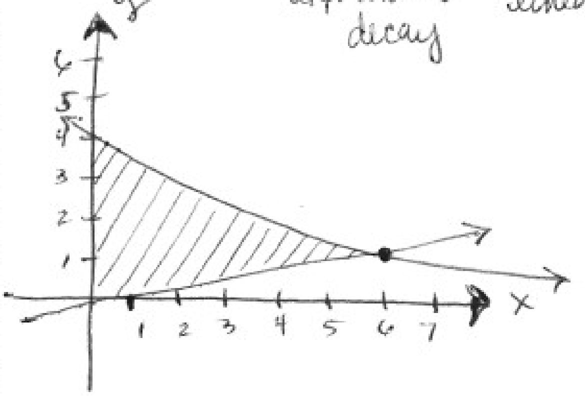
#9 $\int_0^6 \left[4(2^{-x/3}) - \frac{x}{6}\right]dx$

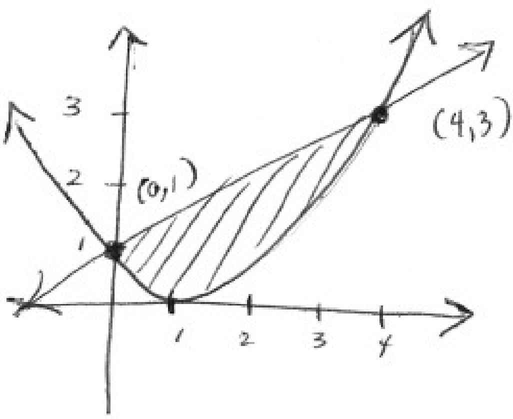
$\uparrow$ exponential decay — linear



#11 $f(x) = x+1$

$g(x) = (x-1)^2$

$A \approx 4$ matches (d)



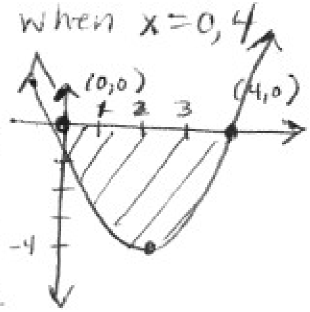
#13 $f(x) = x^2 - 4x$

$g(x) = 0$

Points of intersection:

$x^2 - 4x = 0$

$x(x-4) = 0$ when $x = 0, 4$



$A = \int_0^4 [g(x) - f(x)]dx$

$= -\int_0^4 (x^2 - 4x)dx$

$= -\left[\frac{x^3}{3} - 2x^2\right]_0^4$

$= \frac{32}{3}$

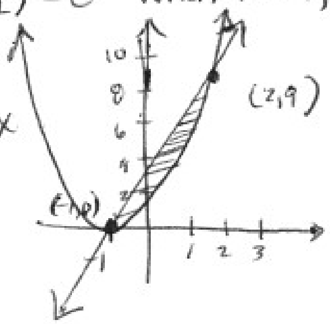
#15 $f(x) = x^2 + 2x + 1$

$g(x) = 3x + 3$

Points of intersection:

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

$(x-2)(x+1) = 0$ when $x = -1, 2$



$A = \int_{-1}^2 [g(x) - f(x)]dx$

$= \int_{-1}^2 [(3x+3) - (x^2+2x+1)]dx$

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

$= \left[2x + \frac{x^2}{2} - \frac{x^3}{3}\right]_{-1}^2 = \frac{9}{2}$

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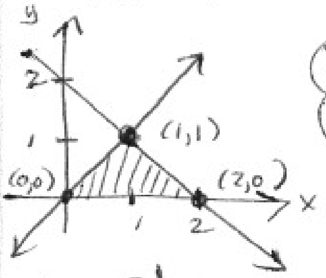
#17 $y = x^{(1)}$ $y = 2 - x^{(2)}$ $y = 0^{(3)}$

Points of intersection:

$x = 2 - x$, $x = 1$ ← (1) & (2)

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

$2 - x = 0$, $x = 2$ (2) & (3)



Notice: If we integrate w.r.t "x" we need 2 integrals

$$A = \int_0^1 [(2-y)-(y)]\,dy$$

$$= \left[2y - y^2\right]_0^1 = 1$$

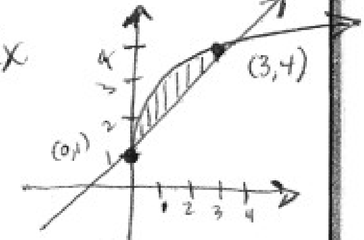
#19 $f(x) = \sqrt{3x} + 1$ $g(x) = x + 1$

Points of intersection:

$\sqrt{3x} + 1 = x + 1$

$\sqrt{3x} = x$ when $x = 0, 3$

$$A = \int_0^3 [f(x) - g(x)]\,dx$$



$$= \int_0^3 [(\sqrt{3x}+1)-(x+1)]\,dx$$

$$= \int_0^3 \left[(3x)^{1/2} - x\right]dx = \left[\frac{2}{9}(3x)^{3/2} - \frac{x^2}{2}\right]_0^3$$

$$= 3/2$$

#21 $f(y) = y^2$ $g(y) = y + 2$

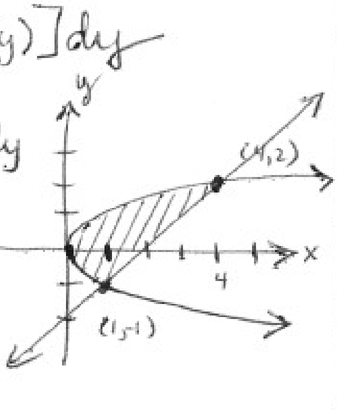
Points of intersection:

$y^2 = y + 2$

$(y-2)(y+1) = 0$ when $y = -1, 2$

$$A = \int_{-1}^2 [g(y) - f(y)]\,dy$$

$$= \int_{-1}^2 [(y+2) - y^2]\,dy$$



$$= \left[2y + \frac{y^2}{2} - \frac{y^3}{3}\right]_{-1}^2$$

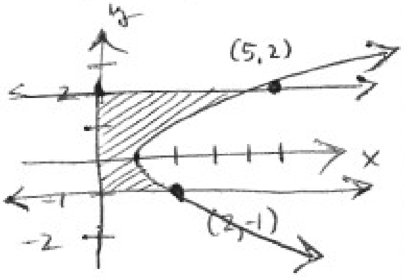
$$= 9/2$$

#23 $f(y) = y^2 + 1$ $g(y) = 0$

$$A = \int_{-1}^2 [f(y) - g(y)]\,dy$$

$y = -1$

$y = 2$



$$= \int_{-1}^2 [(y^2+1) - 0]\,dy$$

$$= \left[\frac{y^3}{3} + y\right]_{-1}^2 = 6$$