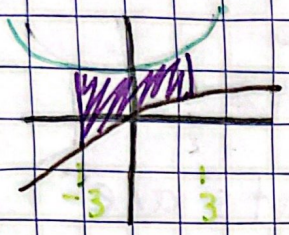
Calculus II
Sept 6th 2024

1) $y = 3x^2 + 12$ and $y = 4x + 4$ $[-3, 3]$



$$\int_{-3}^{3} 3x^2 + 12 - (4x + 4) \cdot dx$$

$$\int_{-3}^{3} 3x^2 - 4x + 8 \cdot dx$$

$$\downarrow \int$$

$$x^3 - 2x^2 + 8x \Big|_{-3}^{3}$$

PEMDAS
( ) x^2 x ÷ + −
inside parentheses

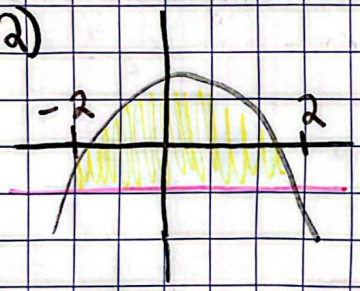
$$[3^3 - 2(3^2) + 8(3)] - [-3^3 - (2(-3))^2 + 8(-3)]$$

$$27 - 18 + 24 \qquad -(-27) - 18 - 24$$

$$33 \qquad -(-69)$$

$$33 \qquad \boxed{102}$$

2)



$y = 2 - x^2$ $\quad y = -2$ $\quad [-2, 2]$

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

$$\int_{-2}^{2} -x^2 + 4 \cdot dx$$

$$\downarrow \int$$

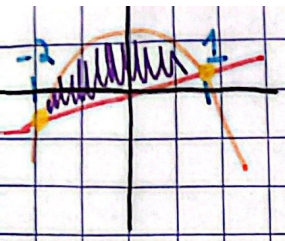
$$\frac{-x^3}{3} + 4x \Big|_{-2}^{2} \quad \text{top - bottom}$$

$$\left[-\frac{2^3}{3} + 4(2)\right] - \left[-\left|\frac{(-2)^3}{3}\right| + 4(-2)\right]$$

$$-\frac{8}{3} + 8 \qquad - \qquad \frac{8}{3} - 8$$

$$\frac{16}{3} - \left(-\frac{16}{3}\right) = \frac{32}{3} = \boxed{10.66}$$

✓



A. Find intersections

$x = 2 - x^2$

$x^2 + x - 2 = 0$

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

$x = 1, -2$

$y = x$ $\quad x^2 = -y + 2$

$x = y$ $\quad x = \sqrt{-y+2}$

$y^2 = \sqrt{-y+2}^2$

$y^2 = -y + 2$

$y^2 + y - 2 = 0$

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

$y = 1, -2$

Points are

$(-2, -2)$ & $(1, 1)$

B. $\int_{-2}^{1} 2 - x^2 - (x)\, dx$

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

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

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

$-\frac{1}{3} - \frac{1}{2} + 2 \qquad \frac{8}{3} - 2 - 4$

$\frac{7}{6} - \left(-\frac{10}{3}\right) = \boxed{4.5}$ ✓

4. top

$f(x) = 8x - 10$ $\quad g(x) = x^2 - 4x + 10$

A. Points of Intersection

(x) $8x - 10 = x^2 - 4x + 10$

$x^2 - 4x - 8x + 10 + 10 = 0$

$x^2 - 12x + 20 = 0$

$(x-2)(x-10) = 0$

$x = 2, 10$

(y) used graph

$\boxed{(2, 6) \text{ \& } (10, 70)}$

*can we use graph on calculator? if not it was using the quadratic formula

$\int_2^{10} 8x-10-(x^2-4x+10)\cdot dx$

$\int_2^{10} 8x-10-x^2+4x-10\cdot dx$

$\int_2^{10} -x^2+12x-20\cdot dx$

$\downarrow \diamond$

$-\frac{x^3}{3}+6x^2-20x\Big|_2^{10}$

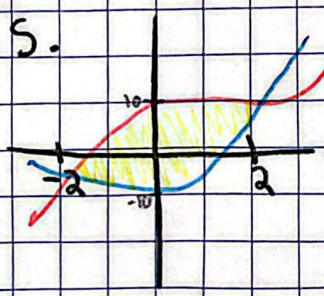
$\left[-\frac{10^3}{3}+6(10^2)-20(10)\right]-\left[-\frac{2^3}{3}+6(2^2)-20(2)\right]$

$-333.33+600-200-\left(-\frac{8}{3}+24-40\right)$

$-\frac{200}{3}-(-18.66)$

$=\boxed{85.32...}$ ✓

15.



$y=x^3-2x^2+10$ $\quad y=3x^2+4x-15$

$\int_{-2}^{2} x^3-2x^2+10-(3x^2+4x-10)\cdot dx$

$\int_{-2}^{2} x^3-2x^2+10-3x^2-4x+10\cdot dx$

$\int_{-2}^{2} x^3-5x^2-4x+20\cdot dx$

$\downarrow \diamond$

$\frac{x^4}{4}-\frac{5}{3}x^3-\frac{4x^2}{2}+20x\Big|_{-2}^{2}$

$\frac{x^4}{4}-\frac{5}{3}x^3-2x^2+20x\Big|_{-2}^{2}$

-8 $\quad -2(-4)$ $\quad -2(-2^2)$

$\left[\frac{2^4}{4}-\frac{5}{3}(2^3)-2(2^2)+20(2)\right]-\left[\left(-\frac{2^4}{4}\right)-\frac{5}{3}(-2^3)-2(-2^2)+20\right.$

$\left(4-\frac{40}{3}-8+40\right)-\left(4+\frac{40}{3}+8-40\right)$

$68/3 \quad -\left(-\frac{92}{3}\right)$

$=\boxed{\frac{160}{3}}$

* the answer is 160/3 I don't know how to fix it

* can we go over Algebra Rules