Name: Richard

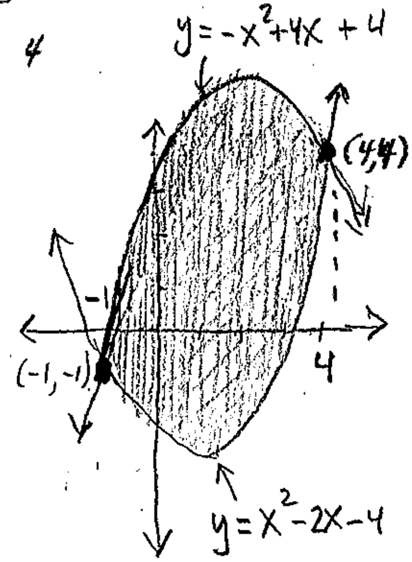
QUIZ 2

MATH 201

January 21, 2025

1. Find the area contained between $\boxed{y = x^2 - 2x - 4}$ and $\boxed{y = -x^2 + 4x + 4}$ (Sketch the curves!)

y intercept: -4 y-intercept: 4



Find the intersection points:

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

$$2x^2 - 6x - 8 = 0$$

$$2(x^2 - 3x - 4) = 0$$

$$2(x+1)(x-4) = 0$$

$x = -1 \qquad x = 4$

Intersections

$$(-1, (-1)^2 - 2(-1) - 4) = (-1, 1)$$

$$(4, 4^2 - 2\cdot 4 - 4) = (4, 4)$$

$$A = \int_{-1}^{4} (-x^2 + 4x + 4) - (x^2 - 2x - 4)\,dx = \int_{-1}^{4} -2x^2 + 6x + 8\,dx$$

$$= \left[-2\frac{x^3}{3} + 3x^2 + 8x\right]_{-1}^{4} = \left(-2\cdot\frac{4^3}{3} + 3\cdot 4^2 + 8\cdot 4\right) - \left(-\frac{2(-1)^3}{3} + 3(-1)^2 + 8(-1)\right)$$

$$= \frac{-128}{3} + 48 + 32 \underbrace{- \frac{2}{3} - 3 + 8} = \frac{-130}{3} + 85$$

$$= \frac{-130}{3} + \frac{255}{3} = \boxed{\frac{125}{3} \text{ square units}}$$

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January 21, 2025

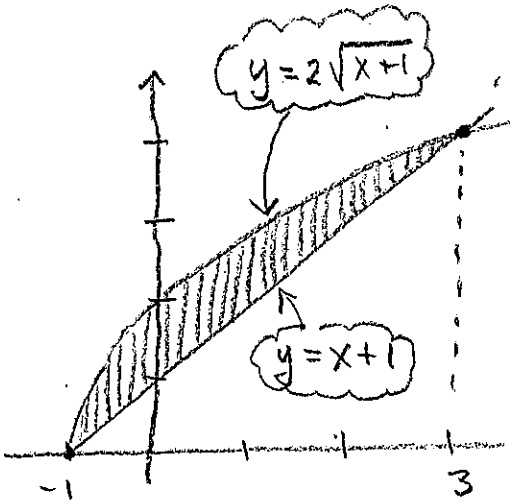
1. Find the area contained between $y = 2\sqrt{x+1}$ and $y = x+1$. (Sketch the curves!)

Find intersection points:

$$2\sqrt{x+1} = x+1$$
$$\left(2\sqrt{x+1}\right)^2 = (x+1)^2$$
$$4(x+1) = x^2+2x+1$$
$$4x+4 = x^2+2x+1$$
$$0 = x^2-2x-3$$
$$0 = (x+1)(x-3)$$

$x = -1$, $y = -1+1 = 0$ $x = 3$, $y = 3+1 = 4$

Intersections:
$(-1, 0)$
$(3, 4)$



$$A = \int_{-1}^{3} 2\sqrt{x+1} - (x+1)\,dx = \left[\frac{2}{3}\sqrt{x+1}^{\,3} - \frac{x^2}{2} - x\right]_{-1}^{3}$$

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

$$= \frac{2}{3}\cdot 0 - \frac{1}{2} + 1 - \frac{2}{3}\sqrt{4}^{\,3} + \frac{9}{2} + 3$$

$$= \frac{1}{2} - \frac{16}{3} + \frac{9}{2} + 3 = \frac{3}{6} - \frac{32}{6} + \frac{27}{6} + \frac{18}{6} = \frac{16}{6}$$

$$= \boxed{\frac{8}{3} \text{ square units}}$$