Name:
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Math 2B: Quiz 4

(7) **1.** Find the volume generated from the following region $\mathcal{R}$ rotated about the following line. $\mathcal{R} = \{y = x, y = -x, x = 2\}$ about $x = 3$

Using the method of cylindrical shells (draw a picture to make this more obvious). The raduis is given by 'right - left'. So $r = 3 - x$ and since the raduis is in the x direction, our integral will be in terms of x. The region is defined on $0 \leq x \leq 2$ so these will be the endpoints for our integral and the height is given by 'top - bottom', which is $h = x - (-x) = 2x$, then our integral has the form

$$\begin{aligned} 2\pi \int_a^b r(x)h(x)dx \quad &\Rightarrow \quad 2\pi \int_0^2 (3-x)(2x)dx \\ &= \quad 4\pi \left[\frac{3x^2}{2} - \frac{x^3}{3} \right]_0^2 \\ &= \quad 4\pi \left(6 - \frac{8}{3} \right) = \frac{40\pi}{3} \end{aligned}$$

(3) **2.** What is the length curve $f(x) = x + \sqrt{2}$ on the interval $0 \leq x \leq 1$

$f'(x) = 1$ so our integral is $\displaystyle\int_0^1 \sqrt{2}dx = \sqrt{2}$.
NOTE: There is an easy way to do this specific problem. After drawing a picture we have a right trangle with two sides of length one. Then the hypotonose is the length of the curve we want. Recall the pythagorean theorem from your 3rd grade geometry class and we have $\sqrt{1^2 + 1^2} = \sqrt{2}$