## The washer and shell method that kicked my butt.

Find the volume of the solid of revolution when $-x^{2}+5 \cdot x$, from $x=1$ to $x=4$ is revolved around the line $x=1$
$2 \cdot \operatorname{Pi} \cdot \int_{1}^{4}(x-1) \cdot\left(-x^{2}+5 \cdot x\right) \mathrm{d} x$

$$
\begin{equation*}
\frac{99 \pi}{2} \tag{1.1}
\end{equation*}
$$

$\mathrm{Pi} \cdot 3^{2} \cdot 4+\mathrm{Pi} \cdot \int_{4}^{\frac{25}{4}}\left(\left(\frac{5}{2}+\operatorname{sqrt}\left(\frac{25}{4}-y\right)-1\right)^{2}-\left(\frac{5}{2}-\operatorname{sqrt}\left(\frac{25}{4}-y\right)-1\right)^{2}\right) \mathrm{d} y$

$$
\begin{equation*}
\frac{99 \pi}{2} \tag{1.2}
\end{equation*}
$$

$f:=x \rightarrow-x^{2}+5 \cdot x$

$$
\begin{equation*}
f:=x \mapsto-x^{2}+5 x \tag{1.3}
\end{equation*}
$$

$f\left(\frac{5}{2}\right)$

$$
\begin{equation*}
\frac{25}{4} \tag{1.4}
\end{equation*}
$$

$f(1)$

$$
\begin{equation*}
4 \tag{1.5}
\end{equation*}
$$

$f(4)$

$$
\begin{equation*}
4 \tag{1.6}
\end{equation*}
$$

solve $(y=f(x), x)$

$$
\begin{equation*}
\frac{5}{2}+\frac{\sqrt{25-4 y}}{2}, \frac{5}{2}-\frac{\sqrt{25-4 y}}{2} \tag{1.7}
\end{equation*}
$$

## Washer and shell method from Test 5, Fall '17

We find the volume of the solid of revolution obtained by revolving the region bounded by $y=4$ $\sqrt{2 x}$ and $y=2 x^{2}$.
$4 \cdot \operatorname{sqrt}(2 \cdot x)$

$$
\begin{equation*}
4 \sqrt{2} \sqrt{x} \tag{2.1}
\end{equation*}
$$

$2 \cdot \mathrm{Pi} \cdot \int_{0}^{2} x \cdot\left(4 \operatorname{sqrt}(2 \cdot x)-2 \cdot x^{2}\right) \mathrm{d} x$

$$
\begin{equation*}
\frac{48 \pi}{5} \tag{2.2}
\end{equation*}
$$

$$
\operatorname{Pi} \cdot \int_{0}^{8}\left(\frac{y}{2}-\left(\frac{y^{2}}{32}\right)^{2}\right) \mathrm{d} y
$$

$$
\begin{equation*}
\frac{48 \pi}{5} \tag{2.3}
\end{equation*}
$$

