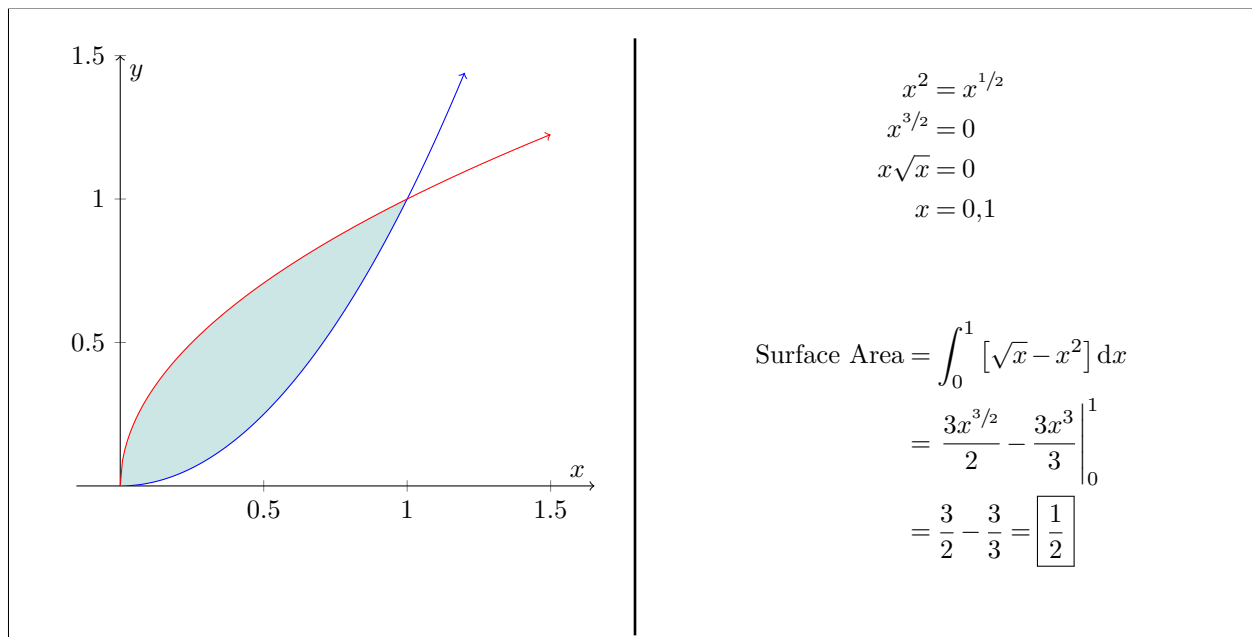


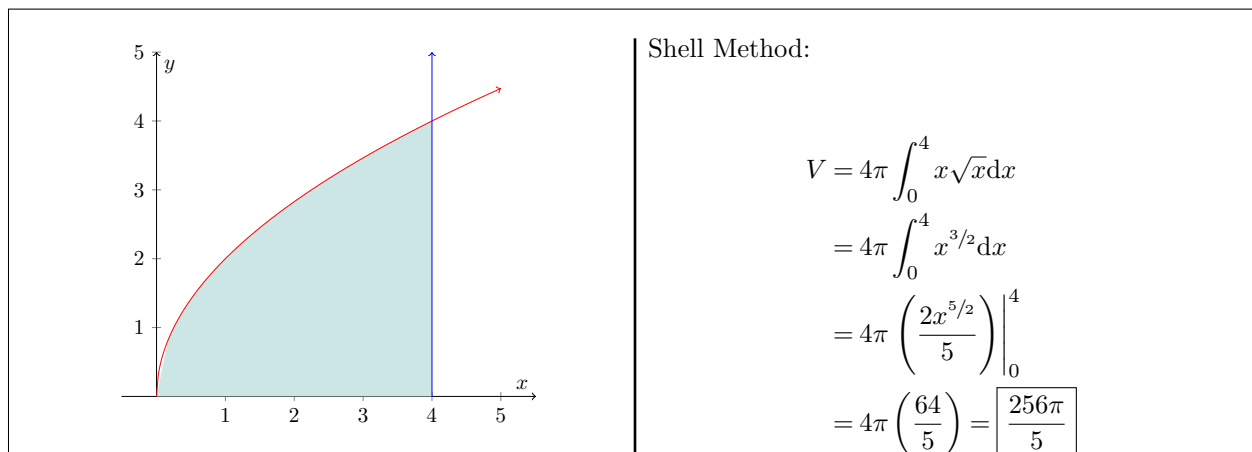
1. Consider the region in the cartesian plane that is bounded by the graphs of $y = x^2$ and $y = \sqrt{x}$. What is the surface area?



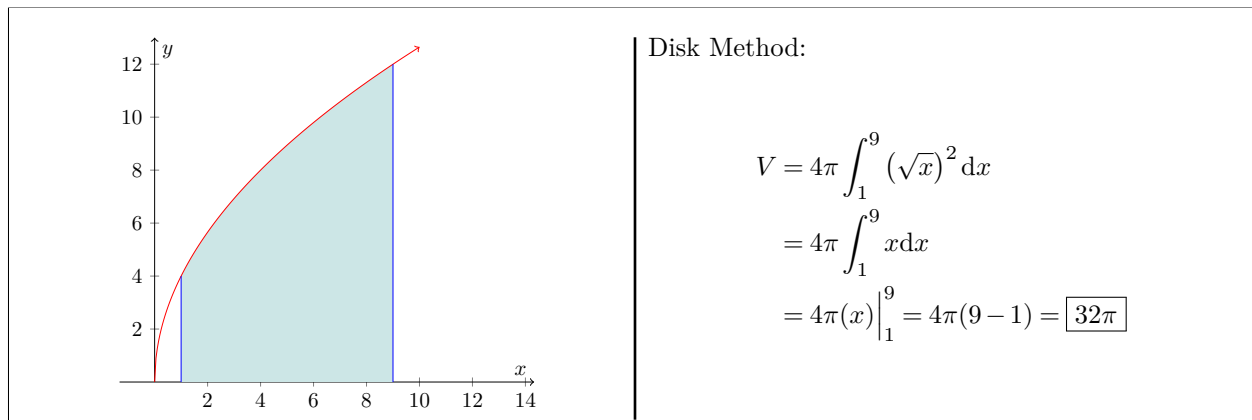
2. Consider the graph of $y = 4x^{3/2}$. Compute the arc-length on the interval $1 \leq x \leq 3$.

$$\begin{aligned} \text{Arc-length} &= \int_a^b \sqrt{1 + f'(x)^2} dx \\ f'(x) &= 6x^{1/2}, \quad a = 1, b = 3 \\ \text{Arc-length} &= \int_1^3 \sqrt{1 + (6x^{1/2})^2} dx \\ &= \int_1^3 \sqrt{1 + 36x} dx \\ &\Rightarrow \frac{1}{36} \int_{37}^{109} \sqrt{u} du \\ &= \frac{1}{36} \left(\frac{2x^{3/2}}{3} \right) \Big|_{37}^{109} \\ &= \boxed{\frac{109\sqrt{109} - 37\sqrt{37}}{54}} \end{aligned}$$

3. Consider the region bounded by $y = 2\sqrt{x}$, the x-axis and $x = 4$. Compute the volume if this is rotated about the y-axis.



4. Consider the graph of $y = 4\sqrt{x}$ where $1 \leq x \leq 9$. Suppose this is rotated about the x-axis. What is the surface area?



5. Evaluate $\int_1^2 \frac{dx}{x\sqrt{1-\ln^2(x)}}$.

$$\begin{aligned}
 &\int_1^2 \frac{dx}{x\sqrt{1-\ln^2(x)}} \\
 &u = \ln(x) \quad -du = \frac{1}{x} dx \\
 &\int_{lower} = \ln(1) = 0 \quad \int^{upper} = \ln(2) \\
 &\int_0^{\ln(2)} \frac{du}{\sqrt{1-u^2}} \\
 &= \arcsin(u) \Big|_0^{\ln(2)} = \boxed{\arcsin(\ln(2))}
 \end{aligned}$$