7.1 #1-9 odd; 19, 37 — area between curves

7.2 #11, 13, 17, 19, 21, 25, 29, 37 — volume of solids of revolution

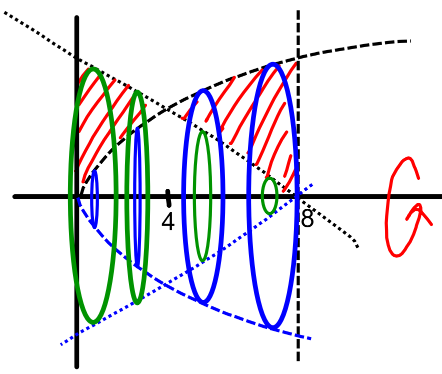
7.4 #7,9,19, 37,39 — arc length & surface area of solids of revolution

needs to be updated for new text:

- 7.1 #5-53 odd — basic integration techniques
- 7.2 #1-35 odd — integration by parts

30. $y=\sqrt{x}$, $y=-\frac{1}{2}x+4$, $x=0$, $x=8$

about x-axis



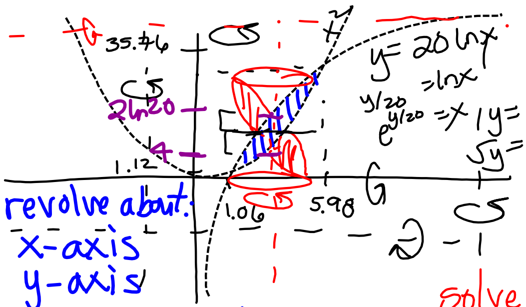
$$\int_0^4 \pi\left(-\tfrac{1}{2}x+4\right)^2 dx - \int_0^4 \pi\left(\sqrt{x}\right)^2 dx$$

$$+\int_4^8 \pi\left(\sqrt{x}\right)^2 dx - \boxed{\int_4^8 \pi\left(\tfrac{1}{2}x+4\right)^2 dx}$$

could replace w/

$\frac{1}{3}\pi(2)^2\cdot 4$

V_{cone}



region bounded by $y = x^2$ & $y = 20\ln x$

$\frac{1}{2}x^2 = \ln x$

solve$\left(\frac{1}{20}x^2 = \ln x, x\right)$

$x \approx 1.06,\ 5.98$

revolve about:
x-axis
y-axis
$x=-1$, $y=-1$
$x=2$, $y=1$
$x=10$, $y=40$

about x-axis: $\int_{1.06}^{5.98} \pi(20\ln x)^2\,dx - \int_{1.06}^{5.98} \pi(x^2)^2\,dx$

about y-axis $\int_{1.12}^{35.76} \pi(\sqrt{y})^2\,dy - \int_{1.12}^{35.76} \pi\left(e^{y/20}\right)^2 dy$

about $y=-1$: $\int_{1.06}^{5.98} \pi(20\ln x+1)^2\,dx - \int_{1.06}^{5.98} \pi(x^2+1)^2\,dx$

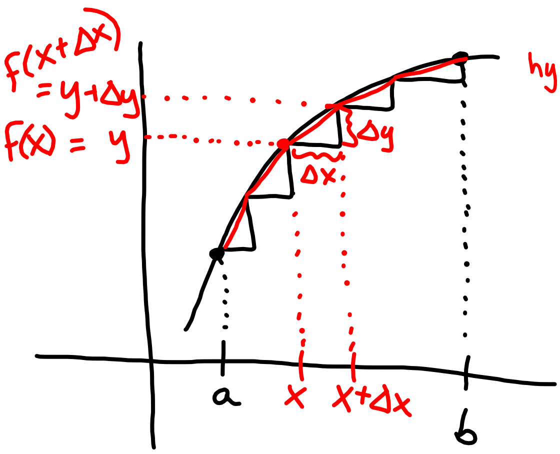
about $x=-1$: $\int_{1.12}^{35.76} \pi(\sqrt{y}+1)^2\,dy - \int_{1.12}^{35.76} \pi(e^{y/20}+1)^2\,dy$

about $x=10$: $\int_{1.12}^{35.76} \pi\left(10-e^{y/20}\right)^2 dy - \int_{1.12}^{35.76} \pi(10-\sqrt{y})^2\,dy$

about $y=40$: $\int_{1.06}^{5.98} \pi(40-x^2)^2\,dx - \int_{1.06}^{5.89} \pi(40-20\ln x)^2\,dx$

6.4 - Arc Length & Surfaces of Revolution

The arc length s of a smooth curve f from a to b is $S = \int_a^b \sqrt{1+[f'(x)]^2}\,dx$



hypotenuse has length $\sqrt{(\Delta x)^2+(\Delta y)^2}$

$= \sqrt{(\Delta x)^2\left[1+\left(\frac{\Delta y}{\Delta x}\right)^2\right]}$

$= \sqrt{1+\left(\frac{\Delta y}{\Delta x}\right)^2} \cdot \Delta x$

MVT $f(x)-f(x+\Delta x) = f'(c)\cdot \Delta x$

$\frac{\Delta y}{\Delta x} = f'(c)$

6. $y = \frac{3}{2}x^{2/3} + 4, \quad [1, 27]$

$$S = \int_a^b \sqrt{1 + [f'(x)]^2}\, dx$$

$$y' = x^{-1/3} = \frac{1}{\sqrt[3]{x}}$$

$$S = \int_1^{27} \sqrt{1 + \left(\frac{1}{\sqrt[3]{x}}\right)^2}\, dx = \int_1^{27} \sqrt{1 + \frac{1}{(\sqrt[3]{x})^2}}\, dx$$

$$= \int_1^{27} \sqrt{\frac{1}{(\sqrt[3]{x})^2}\left(\sqrt[3]{x^2} + 1\right)}\, dx = \int_1^{27} \frac{\sqrt{\sqrt[3]{x^2} + 1}}{\sqrt[3]{x}}\, dx$$

$$= \int_1^{27} \frac{\sqrt{x^{2/3} + 1}}{x^{1/3}}\, dx$$

$u = x^{2/3} + 1$

$du = \frac{2}{3}x^{-1/3}\, dx$

$\frac{3}{2}du = \frac{dx}{x^{1/3}}$

$$= \int \frac{3}{2} u^{1/2}\, du$$