Group Quiz 3
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Math 152 – Spring 2014

Name: _____

No work = no credit

1.) Evaluate $\int_2^8 \sqrt{2t}\ln(2t)\,dt$ $= \int_4^{16} \sqrt{w}\ln(w)\,dw$

Let $w = 2t$

$\frac{dw}{2} = dt$

$w(2) = 4$

$w(8) = 16$

$= \frac{1}{2}\left[\frac{2}{3}w^{3/2}\ln w - \int \frac{2}{3}w^{3/2}\underbrace{\frac{1}{w}}_{w^{1/2}}\,dw\right]_4^{16}$

$= \frac{1}{2}\left[\frac{2}{3}w^{3/2}\ln w - \frac{4}{9}w^{3/2}\right]_4^{16}$

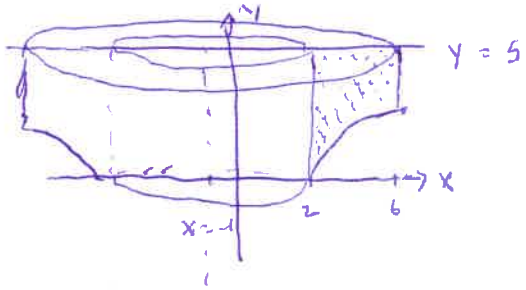
Let $u = \ln w$ $\quad v = \frac{2}{3}w^{3/2}$

$du = \frac{dw}{w}$ $\quad dv = \sqrt{w}\,dw$

$= \frac{1}{2}\left[\frac{2}{3}\cdot 64\ln 16 - \frac{4}{9}\cdot 64 - \frac{2}{3}\cdot 8\ln 4 + \frac{4}{9}\cdot 8\right]$

≈ 43.007

2.) Find the volume of the solid formed by rotating the region bounded by $y = \sqrt{x-2}$; $y = 5$; $x = 2$; and $x = 6$ when rotated about the line $x = -1$



shells: height $5 - \sqrt{x-2}$

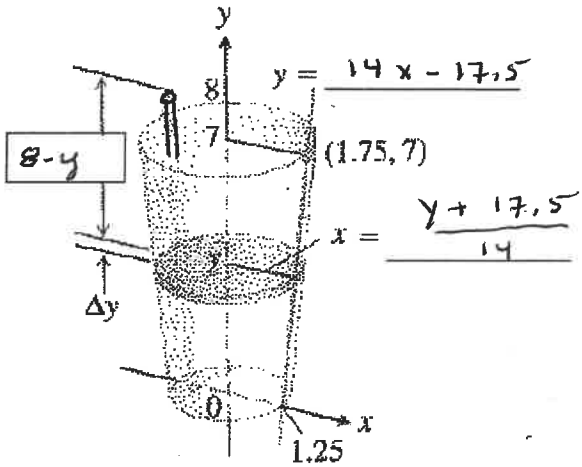
radius $x - (-1) = x + 1$

$V = 2\pi\int_2^6 (x+1)(5-\sqrt{x-2})\,dx$

3.) The peanut butter and hot fudge milkshake pictured is 7 inches tall. The weight-density of the shake is 4/9 oz/in^3. The diameter of the cup is 3.5 inches at the top and 2.5 inches at the bottom. **Set up an integral** to verify that the work required to suck the shake through the straw that extends 1 inch above the top of the cup is 91.32 in-oz.

slope = 14 pt: (1.75, 7)

→ line: $y - 7 = 14(x - 1.75)$



Dimensions in inches

volume $dV = \pi \left(\frac{y + 17.5}{14}\right)^2 dy$

weight or force $df = \frac{4}{9}\pi \left(\frac{y + 17.5}{14}\right)^2 dy$

work $dw = \frac{4}{9}\pi \left(\frac{y + 17.5}{14}\right)^2 (8 - y)\, dy$

Total work $= \int_0^7 \frac{4}{9}\pi \left(\frac{y + 17.5}{14}\right)^2 (8 - y)\, dy$