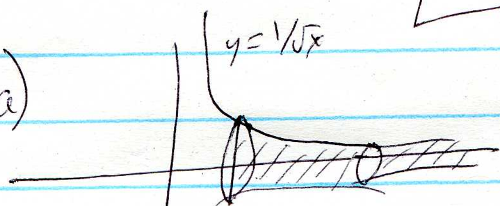
MT Review Answers p 2

2a) $\int_0^8 \pi(2y)\,dy = \pi y^2 \Big]_0^8 = \boxed{64\pi \text{ ft}^3}$

b) $62.5\int_0^8 (8-y)\pi(2y)\,dy = 62.5\pi\left[\frac{16y^2}{2} - \frac{2y^3}{3}\right]_0^8$

$= \boxed{10{,}662 \text{ ft-lb}}$

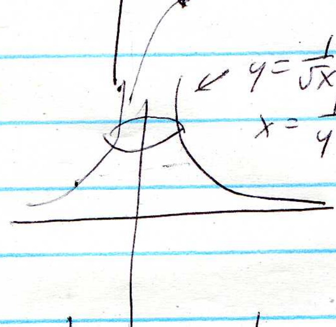
3 a)



$\int_1^\infty \pi\left(\frac{1}{x}\right) dx$

$\boxed{\text{Diverges}}$ since $p = 1$

b)



$\int_1^\infty \pi\left(\frac{1}{y^2}\right)^2 dy$

$= \lim_{R\to\infty} \frac{\pi y^{-3}}{-3}\Big]_1^R = \boxed{\frac{\pi}{3}}$

4 a) $\frac{1}{n^2+n} < \frac{1}{n^2}$ which converges ($p=2$) so $\boxed{\text{Converges}}$

b) $\lim_{n\to\infty} \dfrac{\frac{1}{2^n - n^2}}{\frac{1}{2^n}} = \lim_{n\to\infty} \frac{2^n}{2^n - n^2} = \lim_{n\to\infty} \frac{2^n \ln 2}{2^n \ln 2 - 2n}$

$= \lim_{n\to\infty} \frac{2^n(\ln 2)^2}{2^n(\ln 2)^2 - 2}$

$= \lim_{n\to\infty} \frac{2^n(\ln 2)^3}{2^n(\ln 2)^3} = 1$

so $\boxed{\text{converges}}$ by limit comparison test

c) $\boxed{\text{diverges}}$ by oscillation

d) $\int_2^\infty \frac{1}{x\ln x} = \lim_{R\to\infty}\left[\ln(\ln R) - \ln(\ln 2)\right] \to \infty$

so $\boxed{\text{diverges}}$ by integral test

e) $\sum \frac{2n-3}{3n+1}$ n^{th} term $\to 2/3 \neq 0$ so $\boxed{\text{diverges}}$

f) $\boxed{\text{converges to } 1}$

g) geometric $\boxed{\text{converges to}}$ $.98\left(\frac{1}{1-.98}\right) = \boxed{49}$