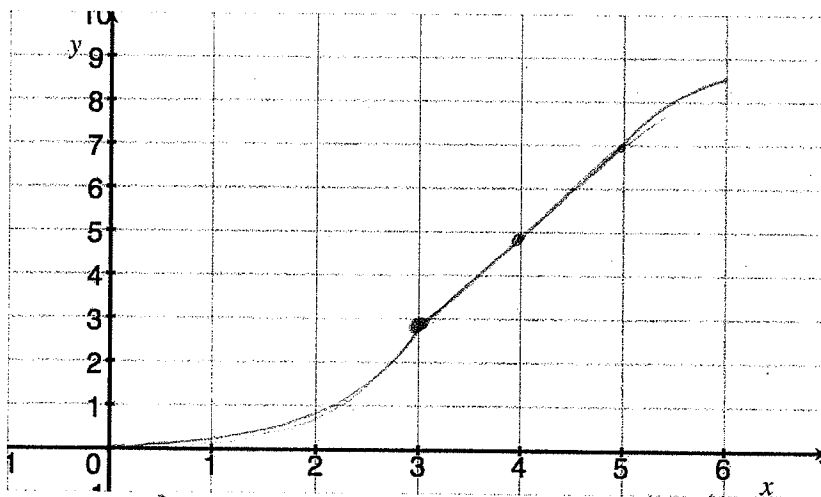
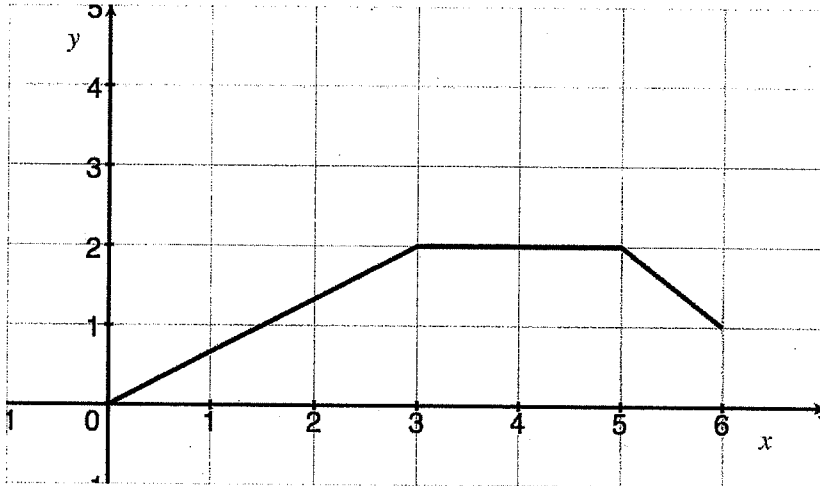


# Quiz 5 Math 252

*Key*

Show *all* your work (algebraically, geometrically, or calculus) for the following.

1. [4] Given the graph of a force function with respect to distance below, graph the total work as a function of distance. *Hint: how much work has been done at distance 0, 1, 2, ...?*

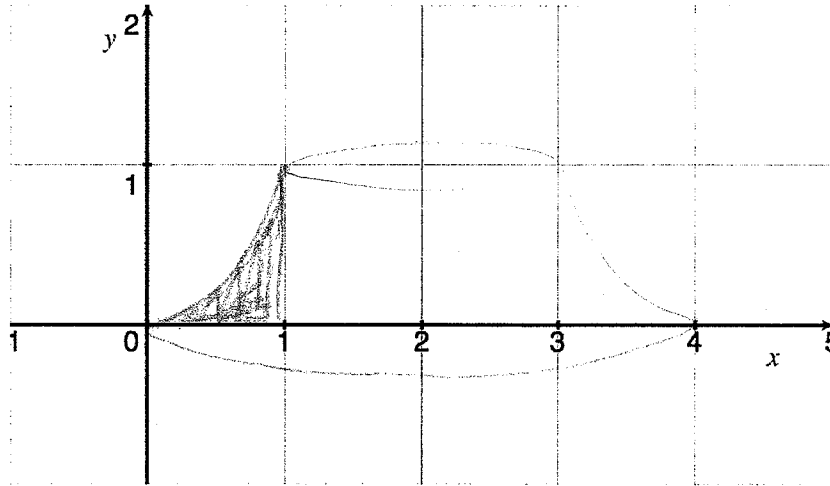


$W(x) = \int_0^x F(x) dx$  (11)

always (11)  
cont (11)

(11)

2. (a) [1] Carefully, draw the area bounded by the graphs of  $y = x^4$ ,  $y = 0$ ,  $x = 1$ .



86.3 #15

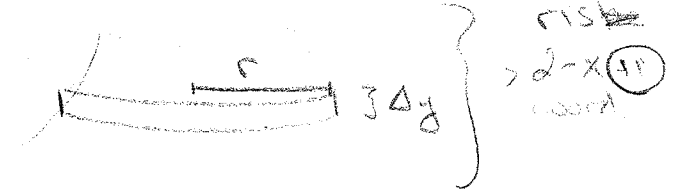
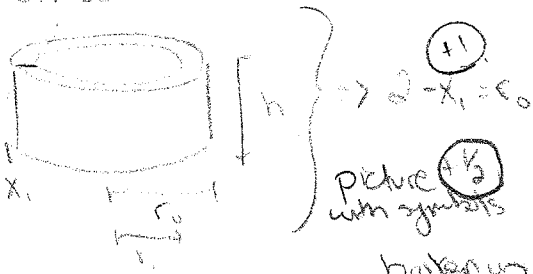
(b) [5] Find the volume of the solid obtained by rotating the region bounded above around the line  $x = 2$ . Hint: the answer is  $\frac{7\pi}{15}$ .

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Cyl method

Disk method



Sum of  $h\pi r_0^2 - h\pi r_1^2$  (1)  
 $= h\pi(r_0 + r_1)(r_0 - r_1)$  (1/2)  
 $= h\pi(r_0 + r_1)\Delta x$  (1/2)  
 $= (x^4)\pi(r_0 + r_1)\Delta x$  (1/2)  
 (Note:  $r_0 + r_1 = 2 - x$ ) (1/2)

Volume outside - Volume inside (1)  
 $\pi r_0^2 (\Delta y)$   
 $\pi (2-x)^2 \Delta y$   
 $\pi (2 - \sqrt[4]{y})^2 \Delta y$   
 $\int_0^1 \pi (2 - \sqrt[4]{y})^2 dy$  - inside cyl (1)

Limit  $\rightarrow$  (1/2)  
 $\int_0^1 x^4 \pi 2(2-x) dx = \pi \int_0^1 4x^4 - 2x^5 dx$  (1/2) ant  
 $= 2\pi \int_0^1 2x^4 - x^5 dx = 2\pi \left[ \frac{2x^5}{5} - \frac{x^6}{6} \right]_0^1$  (1/2) ant  
 $= 2\pi \left[ \frac{2}{5} - \frac{1}{6} \right] = 2\pi \left[ \frac{12-5}{30} \right]$   
 $= \frac{\pi \cdot 7}{15}$

$= \pi \int_0^1 (4 - 4y^{1/4} + y^{1/2}) dy - \pi \cdot 1^2 \cdot 1$  (1/2) ant  
 $= \pi \left[ 4x - \frac{4y^{5/4}}{5/4} + \frac{2}{3} y^{3/2} \right]_0^1 - \pi$  (1/2) ant  
 $= \pi \left[ 4 - \frac{16}{5} + \frac{2}{3} + 1 \right] = \pi \left[ 3 + \frac{48+10}{15} \right]$   
 $= \pi \left[ \frac{45-38}{15} \right] = \frac{\pi \cdot 7}{15}$

14/15