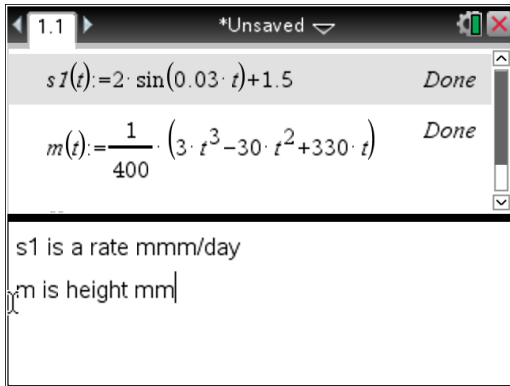
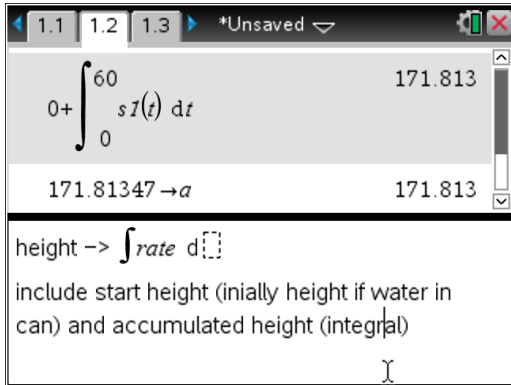


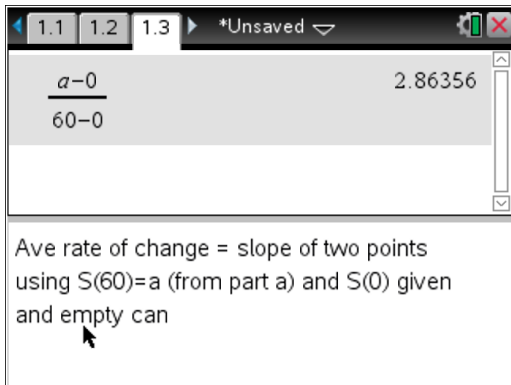
1)



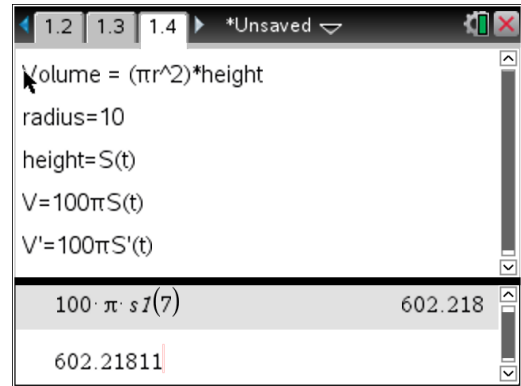
a. We are finding  $S(60) = s(0) + \text{integral below}$ , we store the answers as "a" for use in part b. UNITS "mm"



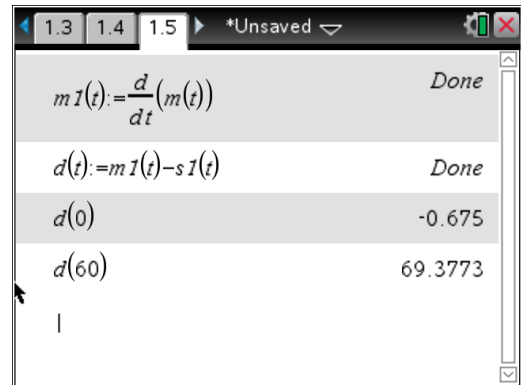
b. UNITS "mm/day"



c. UNITS "mm<sup>3</sup>/day"



d.



d is the difference in the RATES, D is continuous, thus the IVT theorem will apply.  $D(0) < 0$  means that  $M'(t) < S'(t)$  and  $D(60) > 0$  means  $M'(t) > S'(t)$ . So at some point  $D(c) = 0$ , at which time  $M'$  and  $S'$  had to be the same.

2)

TI-84 Plus calculator window showing the definition of  $r(t) = 25 \cdot e^{-0.05 \cdot t}$ . The window title is "\*Unsaved". Below the definition, there is a note: "use the number e not the letter".

a.  $\int_0^{12} P(t) dt$  = store for use in part c

TI-84 Plus calculator window showing the calculation of the integral of  $P(t)$  from 0 to 12 using three subintervals. The calculation is:  $(4-0) \cdot 46 + (8-4) \cdot 57 + (12-8) \cdot 62 = 660$ . The result 660 is stored in variable 'a'. Below the calculation, there is a note: "three subintervals (widths) from 0-4, 4-8, 8-12 with midpoints 2, 6, 10 (use these numbers for heights) these are VOLUMES so the units are ft<sup>3</sup>".

b. Store for use in part c

TI-84 Plus calculator window showing the integral of  $r(t)$  from 0 to 12. The calculation is:  $\int_0^{12} r(t) dt = 225.594$ . The result 225.59418 is stored in variable 'b'. Below the calculation, there is a note: "volume of water  $\rightarrow \int \text{rate of volume } d$ ".

c.

TI-84 Plus calculator window showing the calculation of water in the tank after 12 hours. The calculation is:  $1000 + a - b = 1434.41$ . Below the calculation, there is a note: "Water in tank after 12 hours = water at start + water pumped in over 12 hours - water leaked out over 12 hours NEAREST CUBIC FOOT = 1434".

d.

TI-84 Plus calculator window showing the calculation of  $V'(8)$  and the height  $h$ . The calculation is:  $V'(8) = P(8) - R(8) = 60 - r(8) = 43.242$ . The result 43.24199 is stored in variable 'c'. Below the calculation, there is a note: "V'(t) will represent the rate of volume change V'(t) = P(t) - R(t) (since P and R are already rates) V'(8) = P(8) - R(8) store for next part".

TI-84 Plus calculator window showing the calculation of the height  $h$ . The calculation is:  $V = \pi r^2 h = 144h$ ,  $V' = 144h'$ ,  $V'(8) = 144 \cdot h'(8)$ . The result 0.095586 is stored in variable 'h'. Below the calculation, there is a note: "Want how fast the HEIGHT is changing, h' for calc purposes we will use h for h'(8)".

3) Change the interval to [0,2]

Rolle's Theorem (aka mean value theorem)

$$f'(c) = \frac{f(b) - f(a)}{b - a}$$

$f(x) := 2 \cdot x^4 - 16 \cdot x$  Done

$f'(x) := \frac{d}{dx}(f(x))$  Done

$\text{solve}\left(f'(c) = \frac{f(2) - f(0)}{4 - 0}, c\right)$   $\frac{1}{c = 2^3}$

4)

$$\int_{-\pi}^{\pi} \frac{x \cdot \cos(x^2)}{4} dx = 0$$

5) Graph then use MENU->ANALYZE->ZERO click to the left of the zero for a lower bound and click right of the zero for the upper bound, two zeros means you have to do this twice.

$f1(x) = 4 \cdot x^2 - x^4$

$\int_{-2}^2 f1(x) dx = \frac{128}{15}$