1.) a.) $\int_0^4 E(t)\,dt = 3981.022 \rightarrow \boxed{3{,}981 \text{ gallons}}$

b.) Amt $\rightarrow$ A

$$A = 0 + \int_0^t E(x)\,dx - \int_0^t 645\,dx$$

$$A' = E(t) - 645$$

$$0 = E(t) - 645$$

$t \approx 2.309$

$t \approx 3.559$

+		−		+
	2.309		3.559	

t	$A(t)$
0	0
2.309	1637.178
3.559	1228.520
4	1401.022

since $A'(t) = 0$ when $\boxed{t = 2.309}$ and changes from + to −, this is the time at which amt is maximized.

$$A(2.309) \approx 1637.178 = \boxed{1{,}637 \text{ gallons}}$$

c.) Total cost $= \int_0^4 (.15 - .02t)\cdot E(t)\,dt = 474.320$

$$\boxed{\$474}$$

2.) a.) $\text{Area} = \int_0^1 2^x \, dx + \int_1^{\sqrt{3}} (3-x^2)\, dx$

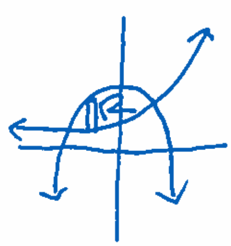
$= 2.240$

b.)

$V = \pi \int_{-1.637}^{1} \left((3-x^2+1)^2 - (2^x+1)^2 \right) dx$

≈ 63.107

c.)



$A_\Delta = \frac{1}{2} bh$ (Isosceles)

$= \frac{1}{2} b \cdot b = \frac{1}{2} b^2$

$V = \frac{1}{2} \int_{-1.637}^{1} (3-x^2-2^x)^2 \, dx$

3.) a.) $H'(10) \approx \frac{80-73}{12-8} = \frac{7}{4}$ $\frac{7}{4}$ °c/min

b.) Avg Temp = $\frac{\text{Integral}}{\text{Interval}}$

$$\text{avg temp.} = \frac{1}{16-0}\int_0^{16} H(t)\,dt$$

$$\text{Avg Temp} \approx \frac{1}{16}\left(65(4) + 68(4) + 73(4) + 80(4)\right)$$

$$= 71.5\,°c$$

c.) Since we used a left Riemann sum, and the function is increasing, our approximation is an underestimate of avg temp.

d.) The data in table validates (is consistent with) the claim that the temp is increasing @ an increasing rate. Over the four intervals, the slopes of secant lines would increase from $\frac{3}{4}$ to $\frac{5}{4}$ to $\frac{7}{4}$ to $\frac{10}{4}$ implying an increasing rate of change.