Math 1b
Problem Set #12

Stewart 6.4

2) $g_{ave} = \frac{1}{4-1}\int_1^4 \sqrt{x}\,dx = \frac{1}{3}\left[\frac{2}{3}x^{\frac{3}{2}}\right]_1^4 = \frac{2}{9}\left[x^{\frac{3}{2}}\right]_1^4 = \frac{2}{9}(8-1) = \frac{14}{9}$

11) Let $t=0$ be 9 a.m. and $t=12$ be 9 p.m.

$$T_{ave} = \frac{1}{12-0}\int_0^{12}\left[50+14\sin\left(\frac{\pi}{12}t\right)\right]dt = \frac{1}{12}\left[50t - 14\left(\frac{12}{\pi}\right)\cos\left(\frac{\pi t}{12}\right)\right]_0^{12}$$

$$= \frac{1}{12}\left[50\cdot 12 - \frac{14}{\pi}\cdot 12\cos(\pi) + \frac{14}{\pi}\cdot 12\cos(0)\right] = \left[50 + \frac{14}{\pi} + \frac{14}{\pi}\right] = 50 + \frac{28}{\pi} \simeq 59^\circ F$$

Stewart 6.3

4) $L = \int_a^b \sqrt{1+\left(\frac{dy}{dx}\right)^2}\,dx \qquad a=0,\ b=3 \qquad y=2^x \qquad \frac{dy}{dx} = 2^x\ln 2$

So, the expression for the arc length is $L = \int_0^3 \sqrt{1+2^{2x}(\ln 2)^2}\,dx$

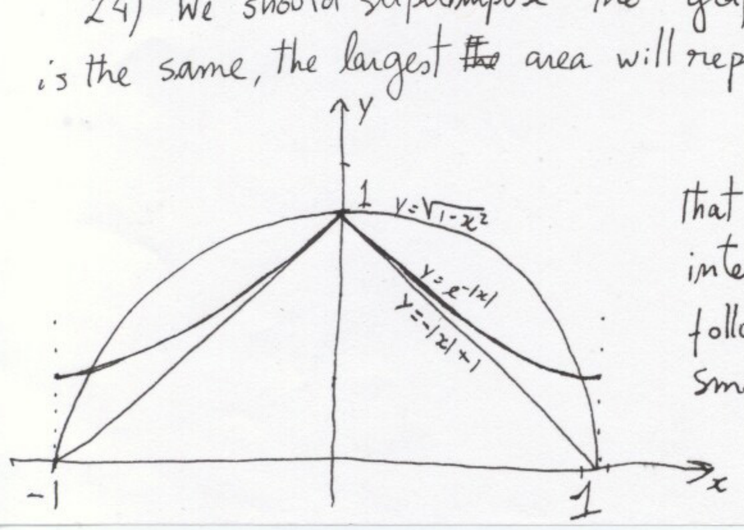
Integration Handout

23) $\int_{-1}^{1} f(x)\,dx$ If January corresponds to $t=0$, $t=-1$ would be December and $t=1$ would be February.

The integral of a rate of change represents the change itself.

→ This integral is the change in the number of zebras in Seronera during the months of December and January.

24) We should superimpose the graphs of the functions a) b) c). Since the interval is the same, the largest ~~the~~ area will represent the greatest average value.



From visual inspection one can conclude that the greatest average value in the interval $[-1,1]$ is that of $y=\sqrt{1-x^2}$ ($\sim .75$), followed by $y=e^{-|x|}$ ($\sim .63$) and the function with smallest average value is $y=-|x|+1$ ($\sim .5$).