1. \( x = t^3 - 4t, \ y = t^2, \ -2 \leq t \leq 2. \)

\[
\text{Area} = \int_{-2}^{2} t^2(3t^2 - 4) \, dt \\
= 2 \int_{0}^{2} (3t^4 - 4t^2) \, dt \\
= 2(3t^5/5 - 4t^3/3)|_0^2 = \frac{256}{15} \text{sq.units.}
\]

2. We have

\[
x'(t) = 0.12 - \frac{10x(t)}{1000 + 2t}.
\]

This is a linear first order ODE with initial condition \( x(0) = 50. \)

3. The series can be written as

\[
\sum_{n=1}^{\infty} (-1)^n \frac{n^{100}2^n}{\sqrt{n!}}.
\]

\[
\lim_{n \to \infty} \frac{a_{n+1}}{a_n} = \frac{(n+1)^{100}2^{n+1}}{\sqrt{(n+1)!}} \cdot \frac{n^{100}2^n}{\sqrt{n!}} \\
= \lim_{n \to \infty} 2 \left( \frac{n+1}{n} \right)^{100} \frac{1}{\sqrt{n+1}} \\
= 0.
\]

So the series converges absolutely.
4. Let \( a_1 = 1 \) and \( a_{n+1} = \sqrt{1 + 2a_n} \) for \( n = 1, 2, 3, \ldots \). Then we have \( a_2 = \sqrt{3} > 1 \). If \( a_{k+1} > a_k \) for some \( k \), then

\[
a_{k+2} = \sqrt{1 + 2a_{k+1}} > \sqrt{1 + 2a_k} = a_{k+1}.
\]

Thus, \( \{a_n\} \) is increasing by induction. Let \( \lim a_n = a \). Then

\[
a = \sqrt{1 + 2a}.
\]

\[
a^2 - 2a - 1 = 0.
\]

\[
a = \frac{2 \pm \sqrt{8}}{2}.
\]

Since \( a > a_1 = 1 \), we have \( \lim a_n = \frac{2 + \sqrt{8}}{2} \).

5. (a) True. With any \( \epsilon > 0 \), there exists \( N \), such that when \( n > N \), we have \( \sqrt{a_n} < \epsilon < 1 \). Since we must have \( a_n < \sqrt{a_n} \), the series \( \sum a_n \) is convergent by comparison.

(b) False.