1: (20 points) A rectangular plot of farmland will be bounded on one side by a river and on the other three sides by a single-strand electric fence. You have 800m of wire to use; what is the largest area you can enclose, and what are its dimensions?

Show all work to receive full credit

2: (20 points) Compute the following.

(a) $\displaystyle\int x^5 + x + 1 \, dx$

(b) $\displaystyle\int \sqrt{x}\left(x^2 + x^{2/3}\right) \, dx$

(c) $\displaystyle\int \frac{x}{x^2 + 5} \, dx$

(d) $\displaystyle\int x\sqrt{7x + 9} \, dx$

3: (20 points) Compute the following.

(a) $\displaystyle\int_3^5 \frac{1}{x\ln(x)}\, dx$

(b) $\displaystyle\int_1^2 x\,(x-3)\, dx$

(c) $\displaystyle\int_0^{\pi/3} \sin^2(x)\cos(x)\, dx$

(d) Find the area under the curve $y = 1 + \cos(x)$ on the interval $[0, \pi]$.

4: (20 points) Compute the following.

(a) Find $\dfrac{dy}{dx}$ of $y = \displaystyle\int_{\tan x}^{0} \dfrac{1}{1+t^2}\, dt$

(b) Find the area enclosed by the graphs of $x = y^3$, $x = y^2$, and the y-axis.

(c) Find the area enclosed by the graphs of $y = 2x^2$ and $y = x^4 - 2x^2$.

5: (20 points) Consider the following.

(a) The region bounded by the curve $y = x^2 + 1$ and the line $y = -x + 3$ is revolved about the x-axis to generate a solid. Find the volume of the solid.

(b) The region bounded by the curves $y = x$, $y = 1$, and $x = 0$ is revolved about the x-axis to generate a solid. Find the volume of the solid.