Answer to Test 1B_Spring 2005

1) Profit = \[ \int_{0}^{2} -3q^2 + 400qdq = -q^3 + 200q^2 \bigg|_{0}^{2} = $792 \]

( There was no initial value condition given in this problem and the trivial initial value condition \( q = 0 \) gives \( R = 0 \) only works for revenue (and not profit) 

2) \( S = \int -2t + 600dt = -t^2 + 600t + C, \; C = 6209 \)
\[ S = -(12)^2 + 800(12) + 6209 = \text{answer} \]

3) \( R(\text{right}) = 50*[290 + 200 + 150] \) (from 250 to 400 items)

4) 
\[ \begin{align*}
\text{a) } & f(x) = \frac{3}{8}x^8 + 4e^x + C \text{ and } \; C = 4 \\
\text{b) } & f(q) = -\frac{1}{3}q^3 + \frac{4}{5}q^5 + C \\
\text{c) } & f(w) = \ln|w| + \frac{(29)^w}{\ln(29)} + C \\
\text{d) } & f(m) = \frac{m^3}{3}x^5k^5 + C \\
\text{e) } & f(x) = \int \frac{1}{2}x^2(x^3 + 5)^2dx \\
\end{align*} \]

let \( u = x^3 + 5 \), \( \frac{du}{3x^2} = dx \)

\[ f(x) = \int_{6}^{32} 2x^2u^4 \frac{du}{3x^2} = \frac{2}{3} \int_{6}^{32} u^4du = \frac{2}{3} \left[ \frac{u^5}{5} \right]_{6}^{32} = \frac{2}{15} [(32)^5 - (6)^5] \]

f) \[ f(x) = \int_{0}^{2} e^{x^3}dx \\
\text{let } u = 8x + 3, \; \frac{du}{8} = dx \]

\[ f(x) = \int_{3}^{19} e^u \frac{du}{8} = \frac{1}{8} e^u \bigg|_{3}^{19} = \frac{1}{8} [e^{19} - e^3] \]

5) Trap Rule
\[ = (1/2)(2)[(0 - 2) + 2*(4 - 2) + 2*(16 - 2) + 2*(36 - 2) + 62] \]

6) Simpson’s Rule
\[ = (1/3)(2)[ 8 + 4(6) + 2(10) + 4(14) + 18] = (2/3)(126) = 84 \; \text{Thousand dollars} \]

It cost 84 thousand dollars to clean up the New River between 1990 and 1998.