Beverly Hills High School -- AP Calculus BC -- Exam #5 -- 110 points

Neat organized presentation of all solutions is what is called for here...do not make me (or the AP examiner) go searching for your answers. Partial credit for partial achievement. SHOW ALL YOUR WORK.

1) Consider the function over the interval (0, 2).
Fifteen points here.

a) Graph the function $y = 8 - \frac{1}{2}x^4$ here.

b) Draw out upper and lower Riemann sums for four intervals but do not evaluate their values.

c) Then give the terms for the upper and lower Riemann sums for four intervals but do not evaluate their values.

d) Determine the actual value of the integral.

2) Express the following Riemann sum as a definite integral (ten points):

$$\lim_{n->\infty} \sum_{k=1}^{n} \sqrt{\frac{1}{n^2}(1 + \frac{2k}{n})}$$

Evaluate the following integrals. Leave logs and roots in their reduced (but not numerical) forms. Five points each. Simplify where possible without a calculator.

3) $\int 3\cos x - x^2 \, dx$

4) $\int_1^2 (2t-3)^2 \, dt$

5) $\int_2^1 \frac{x}{6} - \frac{6}{x} \, dx$

6) $\int_{2\pi/3}^{\pi/3} \sec^2 k - \sin k \, dk$

7) State the Fundamental Theorem of Calculus (both parts) and give a small definition of its meaning: (Ten points)

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8) Consider the function $f(x) = 2 + \frac{2}{x}$ over the interval (2, 4).

a) Draw the appropriate diagram and graph for the trapezoidal approximation method with all the proper labels. (Five points)

b) Using the trapezoidal approximation method, write an expression for the area under the curve using n = 4. No need to evaluate numerically. (Ten points)

c) Determine the actual value of the integral. Use 1.4 for ln 4 and 0.7 for ln 2. (Five points)

9) What is the average value of the function f(x)=(x+4)(x−2) over the interval (-4 , -2)? (Five points)

10) Show that the value of the integral $\int_0^{\pi/3} \sqrt{2 + \cos\theta}\ d\theta$ cannot exceed 2. (Five points)

11) Show and state whether or not the Mean Value Theorem for Integrals applies to problem #9 in the interval stated. Be sure to give the Mean Value Theorem.

12) Evaluate d/dx $\int_{x}^{4x^2} 3\sqrt{2}\ t^2\ dt$ (Ten points).

13) Determine and evaluate a definite integral for which

$\frac{1}{6}[0+4(1)+2(\sqrt{2})+4(\sqrt{3})+2]$ is a Simpson's Rule approximation. (Ten points)