MATH 221 (Washington) Sample Exam 1a

1. (30 points) Evaluate the following:

(a) $\displaystyle\int \frac{(2+5\ln x)^3}{x}\,dx$

(b) $\displaystyle\int (x+2)\ln x\,dx$

(c) $\displaystyle\int_0^\infty xe^{-3x}\,dx$

2. (20 points) (a) Find two values of t with $\cos(3t-2)=0$. Your answers should contain π (that is, they should not be decimals).
(b) Find the height h of the tree in the picture if the angle t is $\pi/3$.
(Imagine a picture of a tree 100 feet away from you. The angle up to the top of the tree is $\pi/3$.)

3. (17 points (10+7)) You have a piece of oceanfront property 60 feet wide. You estimate its area by measuring its length at 0 feet, 20 feet, 40 feet, and 60 feet, as shown in the picture.
(a) Use the trapezoidal rule to estimate the area of the property.
(b) In the picture, draw the trapezoids used in the approximation in part (a).
(There should be a picture like the one on page 443 (in the exercises for Section 9.4) of the book. The distances are 50 feet at 0, 35 feet at 20, 45 feet at 40, and 40 feet at 60.)

4. (10 points) Find the derivative of $\displaystyle\frac{\sin(x^3)}{\cos(x)}$.

5. (17 points (10+7)) A block attached to a spring bounces up and down. At time t, its height above the ground is is given by

$$H(t) = 4 + \cos\Big(\frac{2\pi(t+2)}{24}\Big).$$

(a) How fast is the height increasing when $t=6$?
(b) What is the maximum value of the height? (Give the maximum value of H. You do not need to give the value of t when it occurs. You must explain how you obtained your answer.)

6. (6 points) Evaluate (a) $.027+.653$ (b) $\frac{3}{4}/\frac{5}{7}$ (c) $.04\times.03$

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The following formulas might be useful:

$$\Big(\frac{f}{g}\Big)' = \frac{f'g-fg'}{g^2}, \qquad \int u\,dv = uv - \int v\,du, \qquad \int fg\,dx = fG - \int f'G\,dx$$

$$\text{(trapezoidal) } [f(a_0)+2f(a_1)+\cdots+2f(a_{n-1})+f(a_n)]\frac{\Delta x}{2}$$