Calc 2 - Test #3

WINTER 1990

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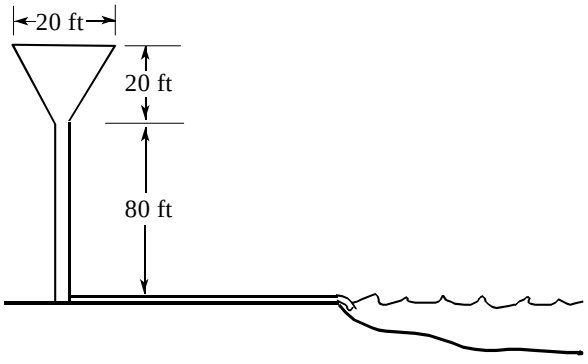
Instructions. Show clearly how you arrive at your answers.

1. Compute: $\int \frac{x^2+6}{x^3+18x} dx =$
2. Compute: $\frac{d}{dx}\left[e^{(\sin(x)+\cos(x))}\right] =$
3. Compute: $\frac{d}{dx}\left[\ln\left(e^{x^2} \cdot \sin x\right)\right] =$
4. Use the properties of natural logs and the facts that $\ln(2) \approx 0.7$ and $\ln(9) = 2.2$ to compute:
   (a) $\ln(4e) =$
   (b) $\ln(36) = \ln(36) =$
   (c) $\ln(6) = \ln(2 \cdot 3) =$
5. Compute: $\int_{x=1}^{x=3} \frac{e^{\frac{3}{x}}}{x^2} dx =$
6. Find the arc length of the function $y = \frac{2}{3}x^{\frac{3}{2}} + 1$ over the interval $[0, 1]$ on the x-axis.
7. A chain weighing 3lb/ft, is hanging from a winch 50 ft above the ground in such a way that the end of the chain just barely touches the ground. How much work is done winding up the chain so that the tip of the chain is 30ft above the ground?
8. Water is pumped from a nearby reservoir to the tank of a water tower shown below. The tank is in the shape of an inverted cone of height 20 ft, and diameter 20 ft., and the bottom of the tank is 80 feet above ground level. If water weighs $100\frac{lb}{ft^3}$, how much work is done in pumping the tank full of water?



9. Compute:

$$\lim_{n\to\infty} \sum_{i=1}^{n} \left(3 + i\frac{2}{n}\right)^2 \left(\frac{2}{n}\right)$$

10. A force of 2 Newtons is required to stretch a spring 1 meter past its point of equilibrium. (1 Newton denoted $1N$, is defined:

$$1N = \frac{\text{1kg-m}}{\text{sec}^2} \quad \text{(i.e., one kilogram meter per second squared))}$$

How much work is done in stretching the spring from 0.5 m past equilibrium to 1.0 m past equilibrium?