Show all work. No calculators allowed.

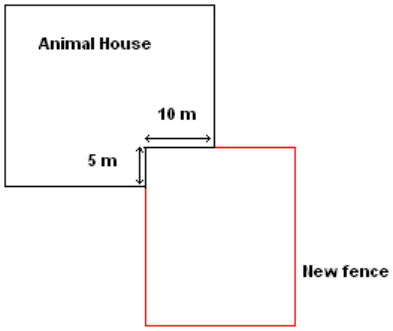
Name and section: _____

1. The volume of a spherical balloon is increasing at a rate of 20 cubic inches per second. When the radius is 4 inches, how fast is the radius of the balloon increasing?

2. Find and classify the extremma using the first derivative test for $f(x) = x^4 - 16x + 2$. Draw the first derivative number line.

3. Find and classify the extremma using the second derivative test for $f(x) = x^2e^x$.

4. We are to build a rnew fence against an animal house in the corner as pictured. We have 100 meters of fencing. What are the dimensions needed to maximize the area?



5. Find the indicated limit.

   (a) $\lim_{x\to\infty} \frac{\ln(x)}{x^2+1}$

   (b) $\lim_{x\to 0^+} x^{x^2}$

6. Compute the Antideivatives

(a) $\int 3\sin(x) - 2\csc(x)\cot(x) + e^x - 2x + 4\,dx$

(b) $\int x^2 - x^{-2} + x - x^{-1}\,dx$

7. Compute the Antiderivative with substitution

$$\int x^2 e^{x^3+1}\, dx$$