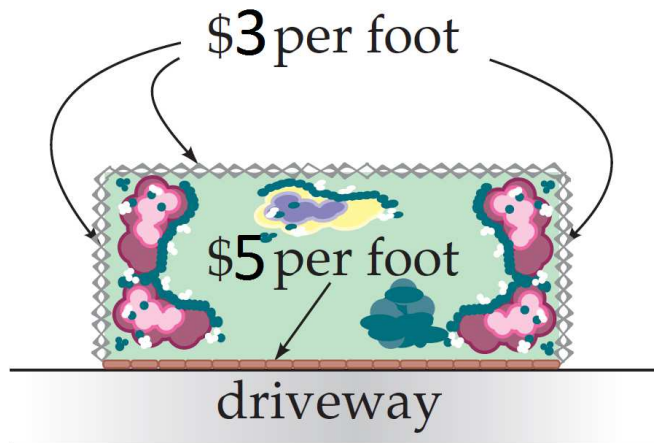


YOUR NAME: _____

George Voutsadakis

Read each problem **very carefully** before starting to solve it. Each problem is worth 10 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

1. Sandra wants to build, along her driveway, a garden surrounded by a fence. If the garden is to be 1200 square feet and the fence along the driveway costs \$5 per foot while on the other three sides it costs only \$3 per foot, find the dimensions that minimize the cost.



2. Find the equation of the tangent line to the curve

$$x^2y + xy^2 - 3x + 5y = 11$$

at the point $(x, y) = (-1, 2)$.

3. Find the equation of the tangent line to $f(x) = \sqrt{x^2 + 2 \ln x}$ at $x = 1$.

4. A certain quantity q changes according to the equation

$$q(t) = 7te^t - \ln(t^2 + 1) + (t^2 + 5t + 2)^3,$$

where q is measured in units and t in seconds.

(a) Find the instantaneous rate of change of q .

(b) How fast is q changing when $t = 0$?

5. A new company is growing so that its value t years from now will be $50t^2$ dollars. This means that, assuming interest rate 8% compounded continuously, its present value is

$$V(t) = 50t^2e^{-0.08t} \text{ dollars.}$$

Find the number of years maximizing the present value.