1. Evaluate the derivative below.

$$\frac{d}{dx}(\frac{2}{3}x^{3}+πx^{2}+7x+1)$$

1. By applying implicit differentiation, find y'(x) below.

$$y\sqrt{x^{2}+y^{2}}=15$$

1. Assume a rectangular flower garden (see figure below) with an area of 32 ft2 is surrounded by a grass border that is 1 ft wide on two sides and 2 ft wide on the other two sides. What dimensions of the garden minimize the combined area of the garden and borders?



1. Find the critical points of the function below. Categorize them as either absolute or local extrema.

$f\left(x\right)=2x^{3}-3x^{2}-36x+12$ for all values of x

1. Assume that the initial (at t = 0) population of a prairie dog community is P(0) = 55 dogs. The community population grows at the rate of P'(t) = 20-t/5 for 0 ≤ t ≤ 200 months. Calculate the population 10 months later (including the initial count).
2. Find the area bound by two function below.

$$y=x^{2}-2x+1y=5x-9$$