

MATH 1090-8: QUIZ 4
no calculators allowed!
September 20, 2007

1. Consider the graph of the following function

$$y = x^2 + 2x + 1.$$

- (a) True or false: The vertex of this graph is a maximum point. Clearly circle one of the following:

TRUE

 FALSE

- (b) Find the x and y coordinates of the vertex of the graph. The formula for the vertex of a parabola is

$$\left(-\frac{b}{2a}, f\left(-\frac{b}{2a}\right)\right).$$

In the case at hand, $a = 1$ and $b = 2$. So the x -coordinate of the vertex is -1 . We plug this in to find a y -coordinate of $(-1)^2 + 2(-1) + 1 = 0$.

- (c) Find the x -intercept(s) of the graph.

We set $y = 0$ and solve $0 = x^2 + 2x + 1$. This factors as $0 = (x + 1)^2$. So $x = -1$ is the only x -intercept.

- (d) Sketch the graph of the function.

The graph is the familiar graph of $y = x^2$ shifted to the left by 1 (which we could have seen immediately by noticing, as in (c), that $y = x^2 + 2x + 1 = (x + 1)^2$).

2. The yield in bushels from a grove of orange trees is given by $Y = x(1000 - x)$ where x is the number of orange trees planted per acre. How many trees will maximize the yield?

The graph of the yield is a parabola opening downward. So we need to find the x -coordinate of the vertex in order to maximize the yield. We use the formula $x = -\frac{b}{2a}$. Here $b = 1000$ and $a = -1$. So the number of trees that one should plant per acre to maximize yield is 500.