Name:

This quiz is designed to give you some practice in an exam-like setting before our second midterm on Wednesday.

1. By selling knives door-to-door, a college student can earn $30.00 a day plus $0.50 for each door the student knocks on.
   (a) Write a function $a(d)$ that gives the amount earned in terms of $d$, the number of doors the student knocks on.
   \[ a(d) = 30 + 0.5d \]
   (b) How many doors must the student knock on in order to earn $45.00 in one day?
   \[ \text{Solution: } 30 \text{ doors} \]
   (c) Graph the function $a(d)$. Label the axes and intercepts. Also label the point corresponding to the situation in part (b). (Keep in mind that $d \geq 0$, so the domain is $[0, \infty)$.)
   \[ \text{Solution: The graph is a ray starting at the point (0, 30), going through the pont (30, 45), and continuing in the positive } x \text{ direction.} \]

2. (a) Let $f(x) = -2x^2$, and let $g(x)$ be $f(x)$ shifted down by 3 units and left by 2 units. Write an equation defining $g(x)$.
   \[ g(x) = -2(x + 2)^2 - 3 \]
   (b) Graph the function $g(x)$.
   \[ \text{Solution: The graph is a parabola with vertex at } (-2, -3), \text{ opening downward. Its } y\text{-intercept is } (0, -11), \text{ so by symmetry it also goes through } (-4, -11). \]

3. The height of an object tossed upward at 104 feet per second is given by
   \[ h(t) = -16t^2 + 104t, \]
   where $t$ is the time in seconds and $h(t)$ is the height above ground in feet.
   (a) What is the greatest height that the object reaches?
(b) At what time will the object hit the ground again?

Solution: (a) The greatest height the object reaches is 169 feet. (The greatest height will occur at the vertex of the parabola. The vertex has $x$-component $x = -\frac{b}{2a} = \frac{13}{4}$, so the greatest height is $h\left(\frac{13}{4}\right) = 169$.)

(b) The object will hit the ground at $t = \frac{13}{2}$, or after 6.5 seconds. (We find this by solving for where $h(t) = 0$.)