Classwork 7, MATH 1113 Harrison Chapman

Name: Key
8:00 or 9:30

1. Find the roots of the quadratic equation $(x-5)(x-8)=7$.

$$x^2 - 13x + 40 = 7$$

$$x^2 - 13x + 33 = 0, \text{ so:}$$

$$\boxed{x = \frac{13 \pm \sqrt{13^2 - 4(1)(33)}}{2}}.$$

2. Express $f(x) = -\frac{3}{4}x^2 + 15x - 78$ in the form $a(x-h)^2 + k$.

$$h = -\frac{b}{2a} = \frac{15}{2(\frac{3}{4})} = 15 \cdot \frac{2}{3} = 10.$$

$$\boxed{f(x) = -\frac{3}{4}(x-10)^2 - 3}$$

$$f(x) = -\frac{3}{4}(x-10)^2 - 78 - \left(-\frac{3}{4}\right)(10^2)$$

3. Find the maximum or minimum value of $g(x) = -2x^2 + 16x - 24$ and state clearly whether it is a maximum or a minimum.

$a < 0$ so maximum is

$$g\left(-\frac{b}{2a}\right) = g\left(\frac{16}{2 \cdot 2}\right) = g(4) =$$

$$\boxed{-2(4)^2 + 16(4) - 24}$$

4. An object is thrown upwards at time $t = 0$. The object's height h in feet above the ground t seconds later is given by the formula,

$$h = -16t^2 + 3t + 8.$$

Determine the exact number of seconds t required for the object to return to the ground.

$h = 0$

$$0 = -16t^2 + 3t + 8, \text{ so:}$$

$$t = \frac{-3 \pm \sqrt{9 - 4(8)(-16)}}{2(-16)}, \text{ but only } \boxed{t = \frac{3 + \sqrt{9 + 4(8)(16)}}{32} \text{ sec}}$$

is positive!

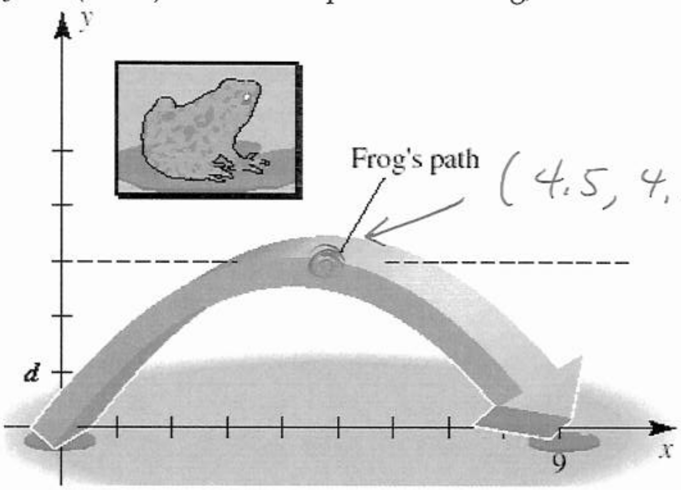
5. Determine the range of the function $h(x) = 6x^2 + 3x + 6$.

$a > 0$ so minimum at: $x = \frac{-b}{2a} = \frac{-3}{12} = -\frac{1}{4}$.

minimum: $h(-\frac{1}{4}) = 6(-\frac{1}{4})^2 + 3(-\frac{1}{4}) + 6$, so:

$\boxed{\text{RANGE } [6(-\tfrac{1}{4})^2 + 3(-\tfrac{1}{4}) + 6, \infty)}$

6. Flights of leaping animals typically have parabolic paths. The figure below illustrates a frog jump. The length of a leap is 9 feet, and the maximum height off the ground is $3d$ feet. Find an equation in the form $y = a(x-h)^2 + k$ for the path of the frog, if $d = 1.5$ feet in the figure.



$(4.5, 4.5)$

So $y = a(x-4.5)^2 + 4.5$

Know point $(0,0)$, so:

$0 = a(0-4.5)^2 + 4.5$

$-4.5 = a(4.5)^2$

$-\frac{1}{4.5} = a$, so

$\boxed{y = -\frac{1}{4.5}(x-4.5)^2 + 4.5}$

7. A business forms a model of its watch sales via a pricing function $p(n) = 400 - \frac{50}{8}n$, where n is the number of watches sold and $p(n)$ is the sales price in dollars per watch.

a) Find the revenue function $R(n)$ for this business.

$R(n) = np(n) = \boxed{400n - \frac{50}{8}n^2}$

b) Find the number n sold which will maximize revenue.

$\boxed{\frac{-400}{2(-\frac{50}{8})} = n.}$ units

c) What is the maximum revenue?

$R\left(\frac{+400}{2(\frac{50}{8})}\right) = \boxed{\$\frac{400^2}{2(\frac{50}{8})} - \frac{50}{8}\left(\frac{400}{2(\frac{50}{8})}\right)^2}$