

2250 -3, Monday September 8
 Computation sheet for Example 2, section 2.3

```
[ > 25*ln(294.0/245);
                                4.558038920
> y:= t-> -245*t + 294*25*(1 - exp(-.04*t));
                                y := t → -245 t + 7350 - 7350 e(-0.04 t)
> v:= t -> 294*exp(-.04*t) - 245;
                                v := t → 294 e(-0.04 t) - 245
> solve(v(t)=0,t); #find when max height
                                4.558038920
> y(4.558038920); #max height
                                108.280465
> solve(y(t)=0,t); #find when returns to ground
                                9.410949931, 0.
> 9.410949931 - 4.558038920; #time descending
                                4.852911011
> v(9.410949931); #speed when it lands
                                -43.2273093
```

Conclusions: bolt rises for 4.56 seconds, to a height of 108.3 meters. Then it spends 4.85 seconds descending, landing with a velocity of -43.3 meters per second.

```
[ > with(plots):
> z:= t->-4.9*t^2 + 49*t; #the no resistance model
                                z := t → -4.9 t2 + 49 t
> plot({z(t),y(t)}, t = 0..10, color=black,
    title='comparison of linear drag vs. no drag models');
```

