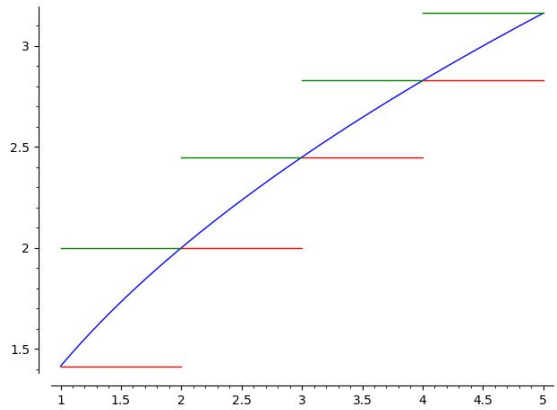
Lab 11
Issac Hertzler - We couldn't
Andrew White

```
def f(x): return sqrt(2*x)
a, b = 1,5
n = 4

print(list(range(n)))
print([i/2 + 1 for i in range(n)])
[0, 1, 2, 3]
[1, 3/2, 2, 5/2]

x_n = [a + (b-a)/n*i for i in range(n+1)]
print(x_n)
[1, 2, 3, 4, 5]
```

Problem 1

a and b are the points for the interval that we would start at. n is how many times the problem is solved, since the n equals 4 then the problem gets solved 4 times using the numbers 1 through 4. i is the numbers that come from the range problems

```
fx_n = [f(i).n() for i in x_n]
print(fx_n)

print("Left endpoints: ", fx_n[:-1])
print("Right endpoints: ", fx_n[1:])

L = (b-a)/n * sum(fx_n[:-1])
R = (b-a)/n * sum(fx_n[1:])
print("Left Approximation: ", L)
print("Right Approximation: ", R)
Left Approximation:  8.69213042990246
Right Approximation:  10.4401945276977

P_f = plot(f(x), x, a, b)
P_L = sum([plot(fx_n[i], x, x_n[i], x_n[i+1], color = "red") for i in range(n)])
P_R = sum([plot(fx_n[i+1], x, x_n[i], x_n[i+1], color = "green") for i in range(n)])
show(P_f + P_L + P_R)
```



Problem 2

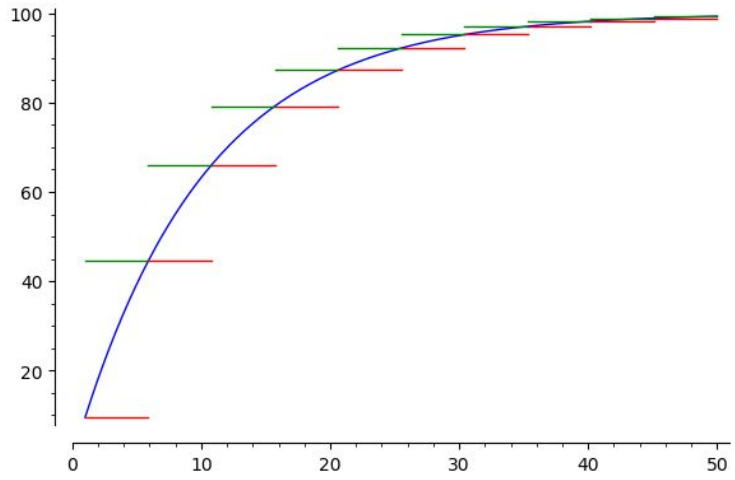
a. Left Approximation: 3763.96818419897
Right Approximation: 4204.03692500704
b. Left Approximation: 3979.71740437727
Right Approximation: 4023.72427845807
c. n = 1,000,000
Left Approximation: 4001.8983286176
Right Approximation: 4001.90272930505

```
def f(x): return 100*(1-e^(-.1*x))
a, b = 1,50
n = 10

print(list(range(n)))
print([i/2 + 1 for i in range(n)])

x_n = [a + (b-a)/n*i for i in range(n+1)]
print(x_n)

fx_n = [f(i).n() for i in x_n]
print(fx_n)

print("Left endpoints: ", fx_n[:-1])
print("Right endpoints: ", fx_n[1:])
```

```
L = (b-a)/n * sum(fx_n[:-1])
R = (b-a)/n * sum(fx_n[1:])
print("Left Approximation: ", L)
print("Right Approximation: ", R)
```

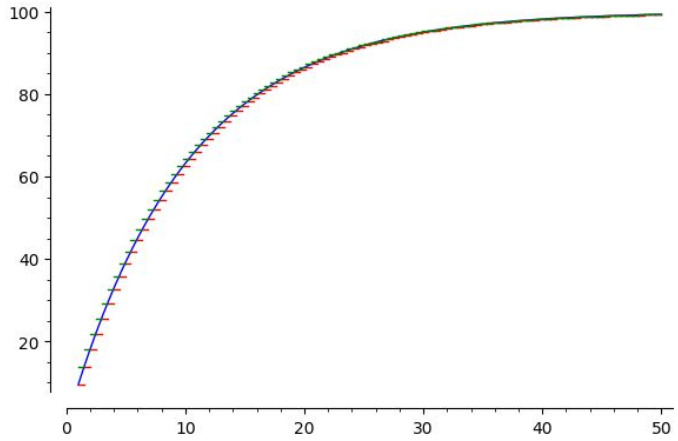
```
Left Approximation:  3763.96818419897
Right Approximation:  4204.03692500704
```

```
P_f = plot(f(x), x, a, b)
P_L = sum([plot(fx_n[i], x, x_n[i], x_n[i+1], color = "red") for i in range(n)])
P_R = sum([plot(fx_n[i+1], x, x_n[i], x_n[i+1], color = "green") for i in range(n)])
show(P_f + P_L + P_R)
```




```
def f(x): return 100*(1-(e)^(-.1*x))
a, b = 1,50
n = 100

#print(list(range(n)))
#print([i/2 + 1 for i in range(n)])

x_n = [a + (b-a)/n*i for i in range(n+1)]
#print(x_n)

fx_n = [f(i).n() for i in x_n]
#print(fx_n)

#print("Left endpoints: ", fx_n[:-1])
#print("Right endpoints: ", fx_n[1:])
```

```
L = (b-a)/n * sum(fx_n[:-1])
R = (b-a)/n * sum(fx_n[1:])
print("Left Approximation: ", L)
print("Right Approximation: ", R)
Left Approximation:  3979.71740437727
Right Approximation:  4023.72427845807

P_f = plot(f(x), x, a, b)
P_L = sum([plot(fx_n[i], x, x_n[i], x_n[i+1], color = "red") for i in range(n)])
P_R = sum([plot(fx_n[i+1], x, x_n[i], x_n[i+1], color = "green") for i in range(n)])
show(P_f + P_L + P_R)
```




```
def f(x): return 100*(1-(e)^(-.1*x))
a, b = 1,50
n = 1000000

#print(list(range(n)))
#print([i/2 + 1 for i in range(n)])

x_n = [a + (b-a)/n*i for i in range(n+1)]
#print(x_n)

fx_n = [f(i).n() for i in x_n]
#print(fx_n)

#print("Left endpoints: ", fx_n[:-1])
#print("Right endpoints: ", fx_n[1:])
```

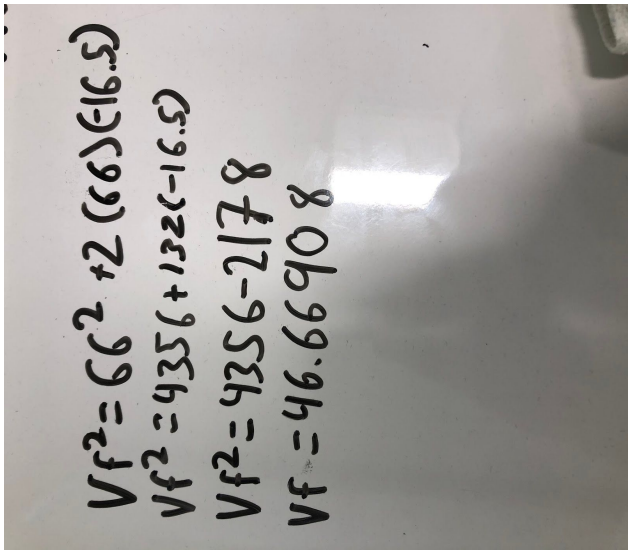
```
L = (b-a)/n * sum(fx_n[:-1])
R = (b-a)/n * sum(fx_n[1:])
print("Left Approximation: ", L)
print("Right Approximation: ", R)
```

Left Approximation: 4001.89832861764
Right Approximation: 4001.90272930505

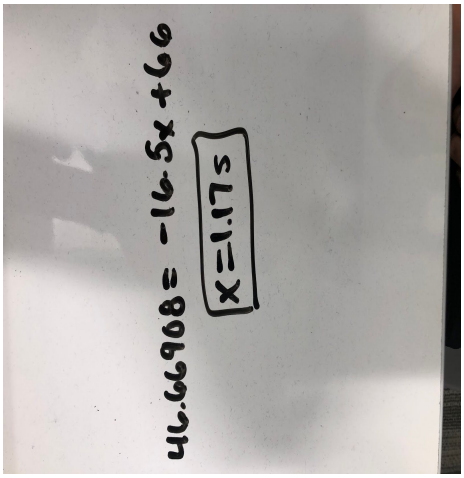
Problem 3

a. 73.333 feet
b. 25.3834 miles per hour
c. 4 seconds
d. 1.17 seconds

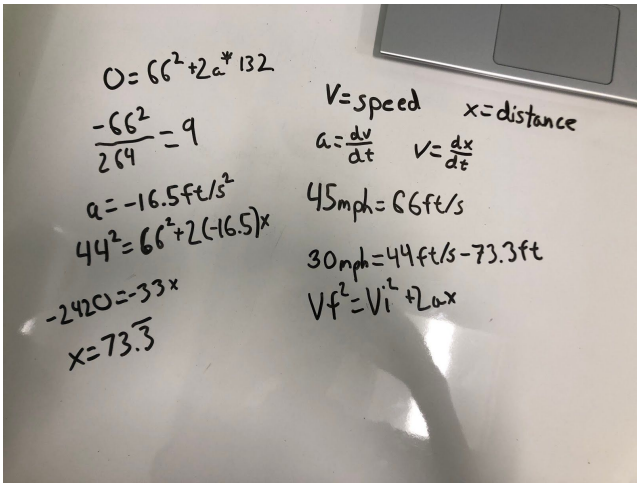
3c).



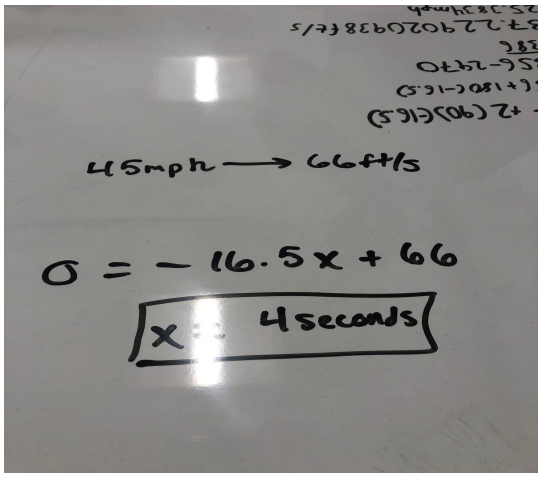
3c).



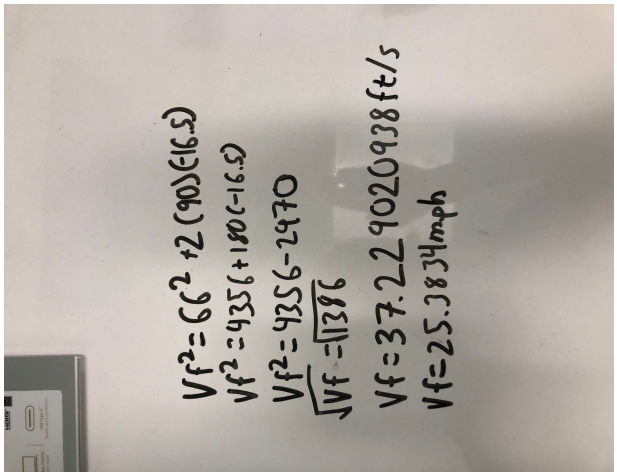
3a).


$0 = 66^2 + 2a * 132$
$\frac{-66^2}{264} = 9$
$a = -16.5 ft/s^2$
$44^2 = 66^2 + 2(-16.5)x$
$-2420 = -33x$
$x = 73.\overline{3}$
V = speed
x = distance
$a = \frac{dv}{dt}$
$V = \frac{dx}{dt}$
45mph = 66ft/s
30mph = 44ft/s - 73.3ft
$Vf^2 = Vi^2 + 2ax$

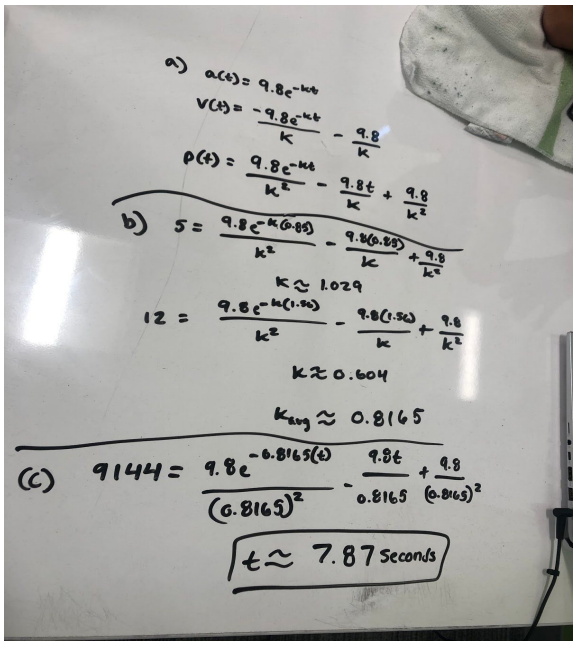
3d).


45mph → 66ft/s
$0 = -16.5x + 66$
x = 4seconds

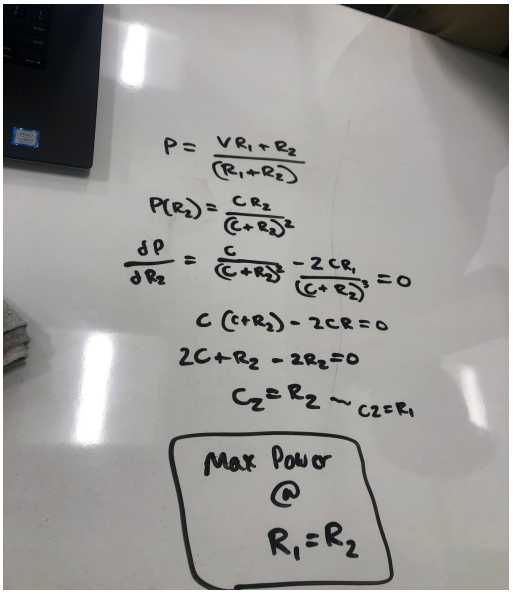
3b).


$Vf^2 = 66^2 + 2(90)(16.5)$
$Vf^2 = 4356 + 180(-16.5)$
$Vf^2 = 4356 - 2970$
$\sqrt{Vf} = \sqrt{1386}$
Vf = 37.229020938 ft/s
Vf = 25.3834mph

4).


a) $a(t) = 9.8e^{-kt}$
$v(t) = \frac{-9.8e^{-kt}}{k} - \frac{9.8}{k}$
$p(t) = \frac{9.8e^{-kt}}{k^2} - \frac{9.8t}{k} + \frac{9.8}{k^2}$
b) $5 = \frac{9.8e^{-k(0.88)}}{k^2} - \frac{9.8(0.88)}{k} + \frac{9.8}{k^2}$
$k \approx 1.029$
$12 = \frac{9.8e^{-k(1.52)}}{k^2} - \frac{9.8(1.52)}{k} + \frac{9.8}{k^2}$
$k \approx 0.604$
$k_{avg} \approx 0.8165$
(c) $9144 = \frac{9.8e^{-0.8165(t)}}{(0.8165)^2} - \frac{9.8t}{0.8165} + \frac{9.8}{(0.8165)^2}$
$t \approx 7.87$ seconds

5).


$P = \frac{VR_1 + R_2}{(R_1 + R_2)}$
$P(R_2) = \frac{CR_2}{(C+R_2)^2}$
$\frac{dP}{dR_2} = \frac{C}{(C+R_2)^2} - \frac{2CR_1}{(C+R_2)^3} = 0$
$C(C+R_2) - 2CR = 0$
$2C + R_2 - 2R_2 = 0$
$C_2 = R_2 \sim C2 = R_1$
Max Power @ $R_1 = R_2$