

Math 120
Autumn 1999
Quiz 3 Solutions

1. (a,b)

$$A(t) = \begin{cases} \frac{3}{4}t & \text{when } 0 \leq t \leq 8 \\ 6 & \text{when } 8 \leq t \leq 20 \\ 6 - 6\sqrt{1 - \left(\frac{t-50}{30}\right)^2} & \text{when } 20 \leq t \leq 50 \end{cases}$$

(c) During its ascent the plane reaches 4000 feet after $\frac{16}{3}$ minutes and during its descent the plane reaches 4000 ft when t is a solution of

$$6 - 6\sqrt{1 - \left(\frac{t-50}{30}\right)^2} = 4.$$

The two solutions are $t = 50 \pm 20\sqrt{2}$. The smaller root is the only one which makes sense. The plane then takes $50 - (50 - 20\sqrt{2}) = 20\sqrt{2}$ min to land. Therefore the total time is $\frac{16}{3} + 20\sqrt{2} \approx 33.6$ min.

(d)

$$\begin{aligned} \frac{h(25) - h(18)}{25 - 18} &= \frac{6\left(1 - \sqrt{\frac{11}{36}}\right) - 6}{7} \\ &= -\frac{\sqrt{11}}{7} \text{ thousand ft/min} \\ &\approx -473.8 \text{ ft/min} \end{aligned}$$

2. (a) all reals except 1

(b)

$$\begin{aligned} \frac{\frac{3+u}{1-(3+u)} - \left(-\frac{3}{2}\right)}{u} &= \frac{\frac{3}{2} - \frac{3+u}{2+u}}{u} \\ &= \frac{1}{2(2+u)} \end{aligned}$$