

Problem 1

For $r(t) = \frac{1}{1+t^2} i + \frac{1}{t} j + \cos^2(t) k$, find $\int r(t) dt$.

Problem 2

For $r(t) = e^{2t} i + \sec^2(t) j + t^4 k$, find $\int_0^{\frac{\pi}{4}} r(t) dt$.

Problem 3

Projectile with arbitrary initial position: Recall from class that we found that if a projectile is launched at an angle of α at a speed of v_0 , then our initial velocity vector function is $v(0) = v_0 \cos(\alpha) i + v_0 \sin(\alpha) j$. Now we shall suppose that (instead of launching from the ground) we launch our projectile from an arbitrary point in space (2-D):

Given $a(t) = -g j$, determine the position function $r(t)$ with the initial conditions:

$$v(0) = v_0 \cos(\alpha) i + v_0 \sin(\alpha) j$$

$$r(0) = x_0 i + y_0 j.$$

(isn't this cool???)

Problem 4

How would you change problem 3 to incorporate headwind/tailwind? (this question is just for pondering, not points).