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------------ HW1 - Josh Oates ------------
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2.23 find gamma(theta) and z(theta)

```
Warning: joshCOE will assume that R and V are normal if the inputs are scalar
ie: the craft is in a circular orbit or is at periapse or apoapse
------------P2.23------------
My calculations have the following results:
Flight path angle (gamma): 44.5973 degrees
H/C: Theta is between 0 and 180, so gamma should be positive
Altitude at theta = 120 degrees: 12246.7575 km
H/C: Altitude is in LEO range
```

2.36 excess V

```
Warning: joshCOE will assume that R and V are normal if the inputs are scalar
ie: the craft is in a circular orbit or is at periapse or apoapse
------------P2.36------------
My calculations have the following results:
Excess escape velocity: 0.84994 km/s
H/C: Hyperbolic tragector should have positive excess escape velocity
r at theta = 100 degrees: 16178.7779 km
H/C: z > 250
Azmuthal velocity at theta = 100 degrees: 4.5064 km/s
H/C: Azmuthal velocity should be positive
Radial velocity at theta = 100 degrees: 5.4488 km/s
H/C: At theta = 100 object is on departure so radial velocity should be
 positive
```

2.37 meteroid

```
------------P2.37------------
```

```
My calculations have the following results:
Eccentricity: 1.086
H/C: For hyperbolic ecc should be above 1
Altitude at periapse: 5087.5854 km
H/C: Altitude at closest approach is lower than initial velocity but high
 enough to orbit
Velocity at closest approach: 8.5158 km/s
H/C: v at closest approach is higher than v initial
```

3.8 time above 400

```
------------P3.8------------
My calculations have the following results:
Time spent over 400 km: 47.1482 min
H/C: time over 400 km is less than period
Intermediate H/C used:
      ecc < 1
      period resonable for LEO
```

3.10

```
------------P3.10------------
My calculations have the following results:
radial position: 42354.9211 km
H/C: r is between rp and ra
speed: 2.3034 km/s
H/C: MEO orbit resonable velocity seems beleivable
radial velocity: -1.2709 km/s
H/C: since period is 14hrs and this is 10hrs in, the orbit is past apoapse, so
 radial velocity should be negative
```

3.20

```
------------P3.20------------
My calculations have the following results:
The final position vector in km:
   1.0e+05 *

    0.2634   -1.2875   -0.2966

The final velocity vector in km/s:
    0.8628   -3.2116   -1.4613

H/C: f*g_dot-f_dot*g value: 1
```

4.5

```
------------P4.5------------
My calculations have the following results:
Semimajor axis: 9081.4773 km
Eccentricity: 0.22261
```

```
True anomaly: 134.7259 degrees
Inclination: 32.445 degrees
Right ascention of ascending node: 107.5713 degrees
Argument of periapse: 72.3586 degrees
h: 58655.7755m^2/s
```

4.7

```
------------P4.7------------
My calculations have the following results:
Inclination of this orbit: 43.2661 degrees
H/C: r vector has a relatively large z component so this makes sense nominally
```

dependencies

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