[redacted]

Applying Analytic Trigonometry to Solve Miscellaneous Complex Problems Using Double-Angle, Power-Reducing and Even-Odd Identities Formulas and Half-Angle, Quotient, Pythogorean, Even-Odd and Reciprocal Identities.

$\frac{secx-1}{2secx} = sin^2\frac{x}{2}$

$= \frac{secx}{2secx} - \frac{1}{2secx}$

$= \frac{1}{2} - \frac{1}{2} \times \frac{1}{secx}$

$= \frac{1}{2} - \frac{1}{2} \times cosx$

$= \frac{1}{2} - \frac{cosx}{2}$

$= \frac{1-cosx}{2}$

$= sin^2\frac{x}{2}$ (proven)

$\frac{cscx-cotx}{2cscx} = sin^2\frac{x}{2}$

$= \frac{\frac{1}{sinx} - \frac{cosx}{sinx}}{\frac{2}{sinx}}$

$= \frac{sinx-cosxsinx}{sin^{2x}} \times \frac{sinx}{2}$

$= \frac{sinx(1-cosx)}{sin^2x} \times \frac{sinx}{2}$

$= \frac{1-cosx}{2}$

$= sin^2\frac{x}{2}$ (proven)

$cos^2\frac{x}{2} = \frac{sinx+tanx}{2tanx}$

$= \frac{sinx}{2tanx} + \frac{tanx}{2tanx}$

$= \frac{sinx}{2\times\frac{sinx}{cosx}} + \frac{1}{2}$

$= (sinx \times \frac{cosx}{2sinx} + \frac{1}{2}$

$= \frac{cosx+1}{2} + \frac{1}{2}$

$= \frac{cosx+1}{2}$

$= cos^2\frac{x}{2}$ (proven)

$cos^2\frac{x}{2} = \frac{secx+1}{2secx}$

$= \frac{\frac{1}{cosx}+1}{2\times\frac{1}{cosx}}$

$= \frac{\frac{1+cosx}{cosx}}{\frac{2}{cosx}}$

$= \frac{1+cosx}{cosx} \times \frac{cosx}{2}$

$2tan\frac{x}{2} = \frac{sin^2x+1-cos^2x}{sinx(1+cosx)}$

$= \frac{sin^2x+1-(1-sin^2x)}{sinx(1+cosx)}$

$= \frac{sin^2x+1-1+sin^2x}{sinx\,(1+cosx)}$

$= \frac{2sin^2x}{sinx(1+cosx)}$

$= 2\sqrt{\frac{1-cosx}{1+cosx}}$

$= 2tan\frac{x}{2}$ (proven)

$cos^2x(1 + tan^2x) = 1$

$= cos^2x \times sec^2x$

$= \frac{cos^2x}{cos^2x}$

= 1 (proven)

$\frac{tanxcotx}{cscx} = sinx$

$= \frac{\frac{sinx}{cosx}\times\frac{cosx}{sinx}}{\frac{1}{sinx}}$

$= \frac{1}{\frac{1}{sinx}}$

$= 1 \times sinx$

= sinx (proven)

$tan(-x)cosx = -sinx$

$= -tanxcosx$

$= -\frac{sinx}{cosx} \times cosx$

$= -sinx$ (proven)

$cosxcotx = \frac{1-sin^2x}{sinx}$

$= \frac{1-sin^2x}{sinx}$

$= \frac{cos^2x}{sinx}$

$= cosx \times \frac{cosx}{sinx}$

= $cosxcotx$ (proven)

$tanx + cotx = secxcscx$

= $\frac{sinx}{cosx} + \frac{cosx}{sinx}$

= $\frac{sin^2x+cos^2x}{cosxsinx}$

= $\frac{1}{cosxsinx}$

= cscxsecx (proven)

$cot(-x)sinx = -cosx$

= $-cotxsinx$

= $-\frac{cosx}{sinx} \times sinx$

= $-cosx$ (proven)

$sin2x - tanx = tanx - cos2x$

$= 2sinxcosx - tanx$

=$2sinxcosx - \frac{sinx}{cosx}$

=$\frac{2sinxcos^2x}{cosx}$

= $\frac{sinx(2cos^2x-1)}{cosx}$

=$\frac{sinx}{cosx} \times (2cos^2x - 1)$

= $tanx \times cos2x\ (Double - Angle\ Formula)$

$sin2x - cotx = -cotxcos2x$

$= 2sinxcosx - \frac{cosx}{sinx}$

=$\frac{cosx(2sin^2x-1)}{sinx}$

=$\frac{cosx}{sinx} \times 2sin^2 - 1$

= $cotx \times 2sin^2x - 1$

=$-cotx \times -cos2x$

= $-cotx \times cos2x\ (Double - Angle\ Formula)$

= -cotxcos2x (proven)

$sin^2x + cos2x = cos^2x$

= $1 - cos^2x + 2cos^2x - 1$

= cos^2x (proven)

$1 - tan^2x = \frac{cos2x}{cos^2x}$

$$= 1 - \frac{1-cos2x}{1+cos2x}$$

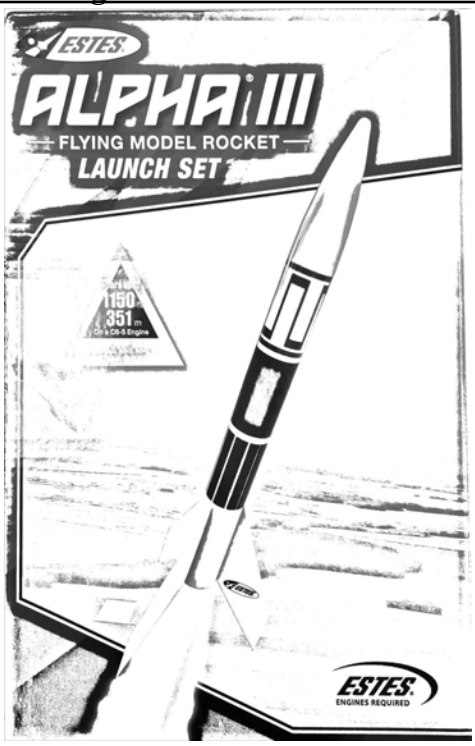
$$= \frac{1=cos2x-1+cos2x}{1+cos2x}$$

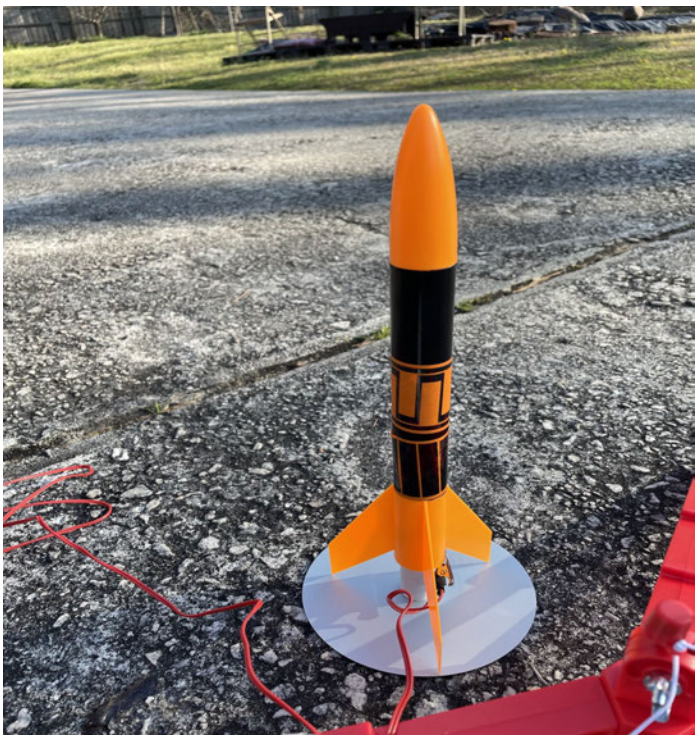
$$= \frac{2cos2x}{1+cos2x}$$

$$= \frac{2cos2x}{1+2cos^2x-1}$$

$$= \frac{cos2x}{cos^2x}$$

Finding the Altitude of Model Rocket Using Trigonometry;



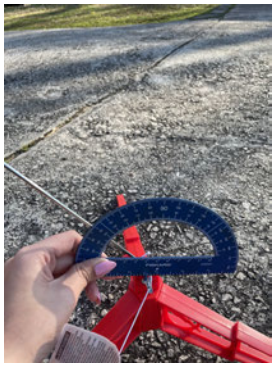


Setting up the Model Rocket;

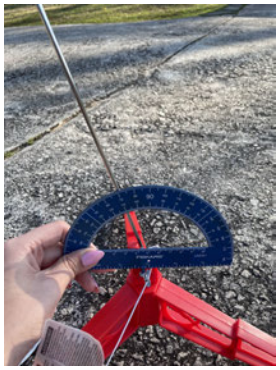
At first, the launch pad was set up. The three legs were joined to the hub. The swivel mounts were attached to the two swivel discs. The mount was connected using a wing nut and hex head screw. The launch rod was then attached to the hub. The launch pieces were joined together. Sand joints were used for both ends and joints as brought joint could hinder the performance of the rocket. Then the stand-off stern was inserted into the launch rod. Then the

base deflector plate was inserted. The slide blast deflector plate was attached to the stand-off stern. As the launch rod was inserted into the small hole in the hub the wing nut was tightened to secure that the rod stands fixed in position. This was then loosened to adjust the angles from where the rocket was launched. Slide blast deflector with stand-off over launch rod.
At first, the controller was opened using a screwdriver. 1.5 V alkaline batteries were inserted, following the polarity markings. To replace covers on controllers, a tab was inserted into the eyelet. For the controller, two micro-clips were connected then the safety key was inserted. As the safety key was pressed down hard the light bulb was lit, proving the controller was lit, and the controller is active.
The Alpha 3 rocket consists of 12 components in total. Plastic fin unit, green split adapter, engine mount tube, Mylar retainer ring, Green adaptor ring, launch lug, nose cone, body tube, engine hook, parachute shook cord, nose cone screw, self-stick decal, nose cone screw, shock cord, parachute, engine hook, The fin mount was assembled using glue and fin units. The launch was a stick body tube using yellow glue, The body tube was attached with fins to the body tube, centered between fins, and it was let to dry properly.
The shock cord mount was inserted into the body tube. The shock cord mount had to be held till it dried completely otherwise it would fall off. The flight recovery was then prepared. The push recovery wadding towards the end of the body tube. 3-4 squares esters, wrap lines loosely and insert parachute into the body tube. Insert the nose cone into the body tube. The wrap lines were loosely inserted parachute into body tube, insert nose cone into body tube and the nose come was inserted. The tip of the starter must touch the propellant. The decals were applied to the body of the Alpha 3 rocket.

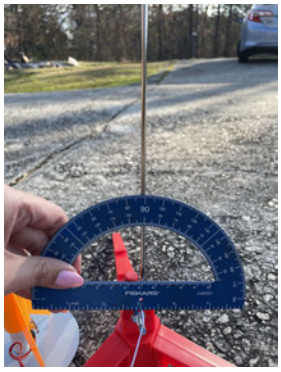
Launching the rocket at three different angles: 90°, 70°, 40°;



Angle used: 40°
Height reached: 218m



Angle used: 70°
Height reached: 273m



Angle used: 90°
Height reached: 309m