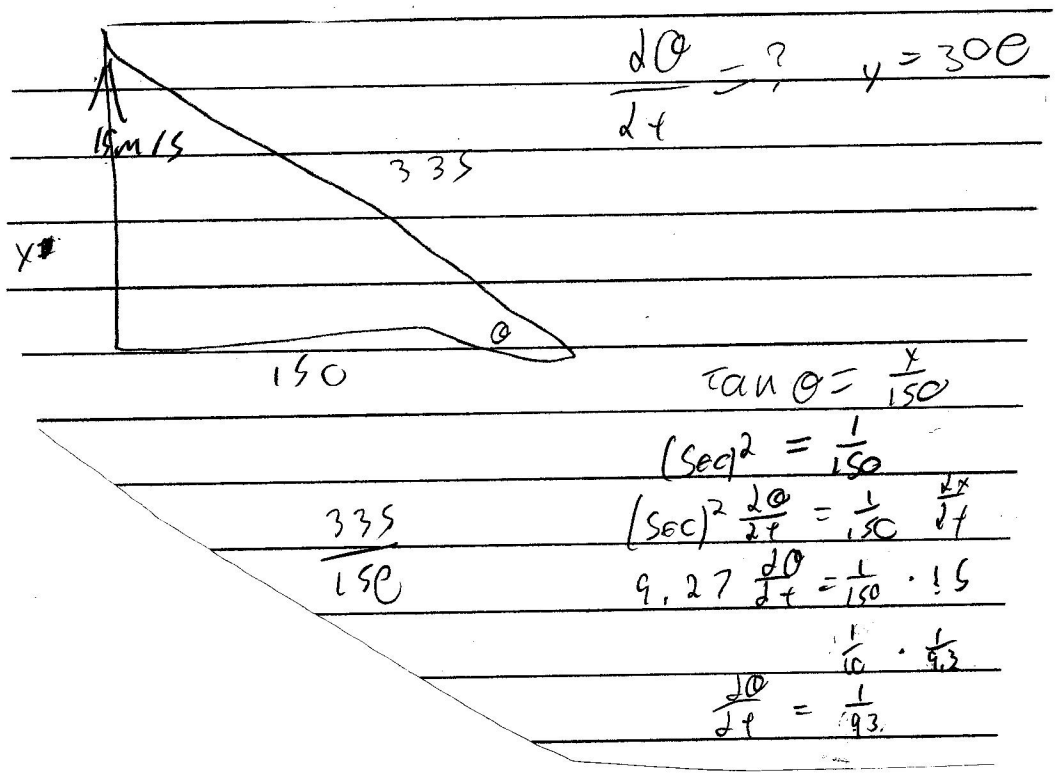
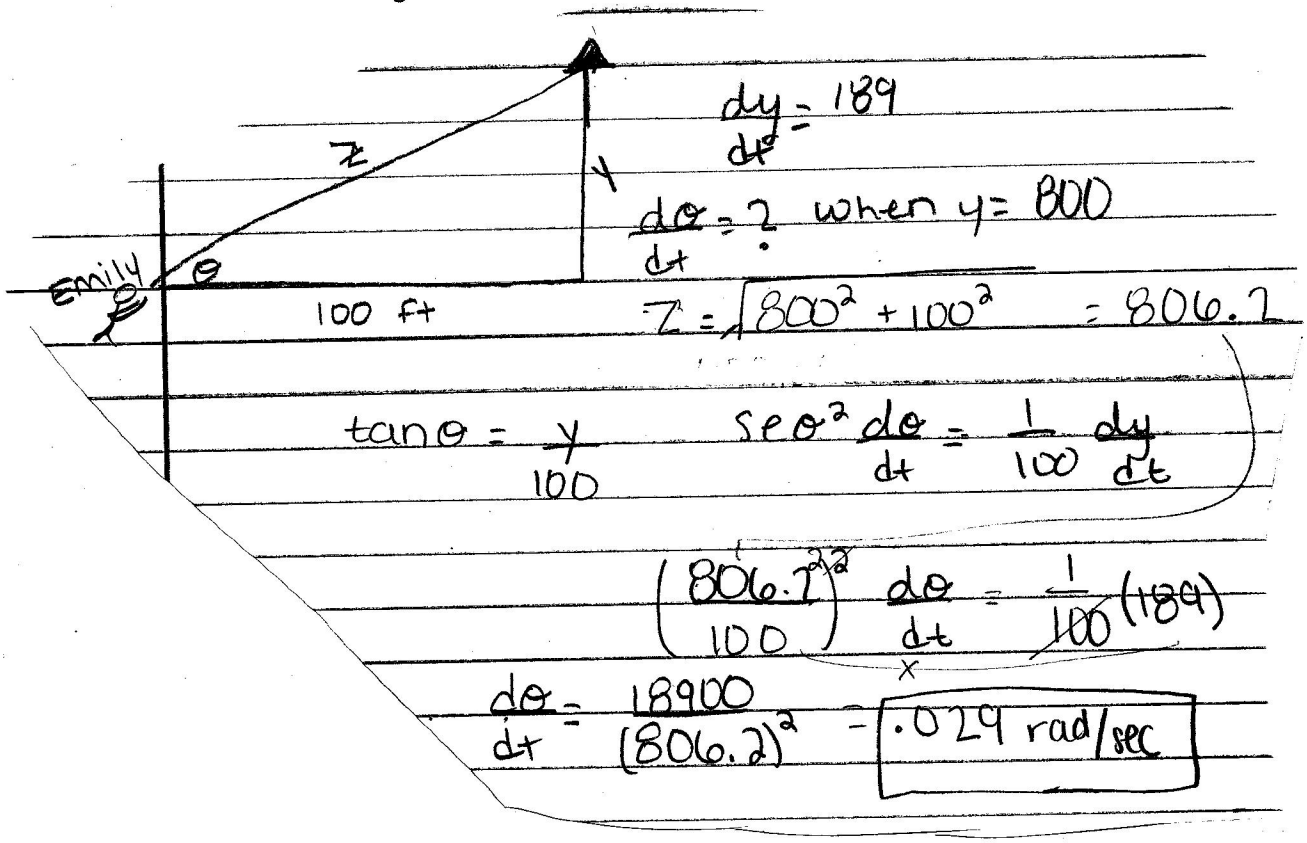
#3 Sterling Schaefer

Bill is flying straight up at 15 m/s and joe is 150 m away watching through a telescope, what is the rate of change through joes telescope when bill is 300 feet above the ground?



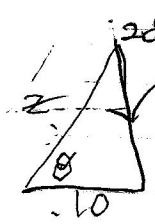
#3 Kennedy Reid

A bird is rising vertically at 189 ft/sec. If Emily is watching the bird through a telescope and Emily is 100 feet from the ground, what is the rate of change of the angle of elevation of the telescope when the bird is 800 ft off the ground?



#3 Jessica Cheney

The Chilean miners are being rescued through the emergency elevator. The elevator is descending to rescue another miner at the rate of 20 ft/s. If a miner is standing 10 feet away from the base of the elevator shaft, at what rate is the angle of elevation between the miner and the elevator decreasing when the elevator is 100 ft from the base of the shaft?



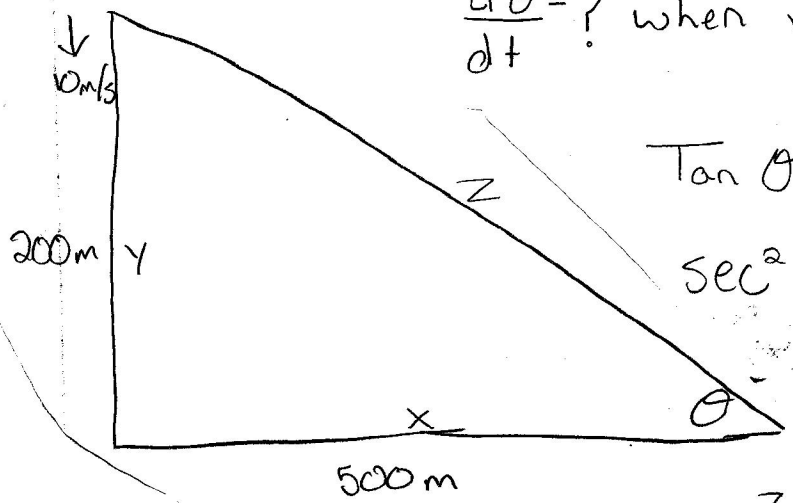
$\frac{d\theta}{dt} = ?$ when $y = 100$

$\sec^2\theta \frac{d\theta}{dt} = \frac{1}{10}\frac{dy}{dt}$

$\frac{10100}{10000}\frac{d\theta}{dt} = \frac{-20}{10} = -1.98$ rad/s

#3 Daric Teske

If Trevor Phillips jumped out of a cargo jet, and parachuted straight down at a constant rate of 10 m/s, and Michael Townley is 500 m away watching him down safely with high-powered binoculars, what is the rate of angle change of Michael's binoculars in order to keep Trevor in view when Trevor is 200 m above the ground.



$\frac{d\theta}{dt} = ?$ when $y = 200m$

$\tan\theta = \frac{y}{500}$

$\sec^2\theta \frac{d\theta}{dt} = \frac{1}{500}\frac{dy}{dt}$

$\sec\theta = \frac{z}{x}$

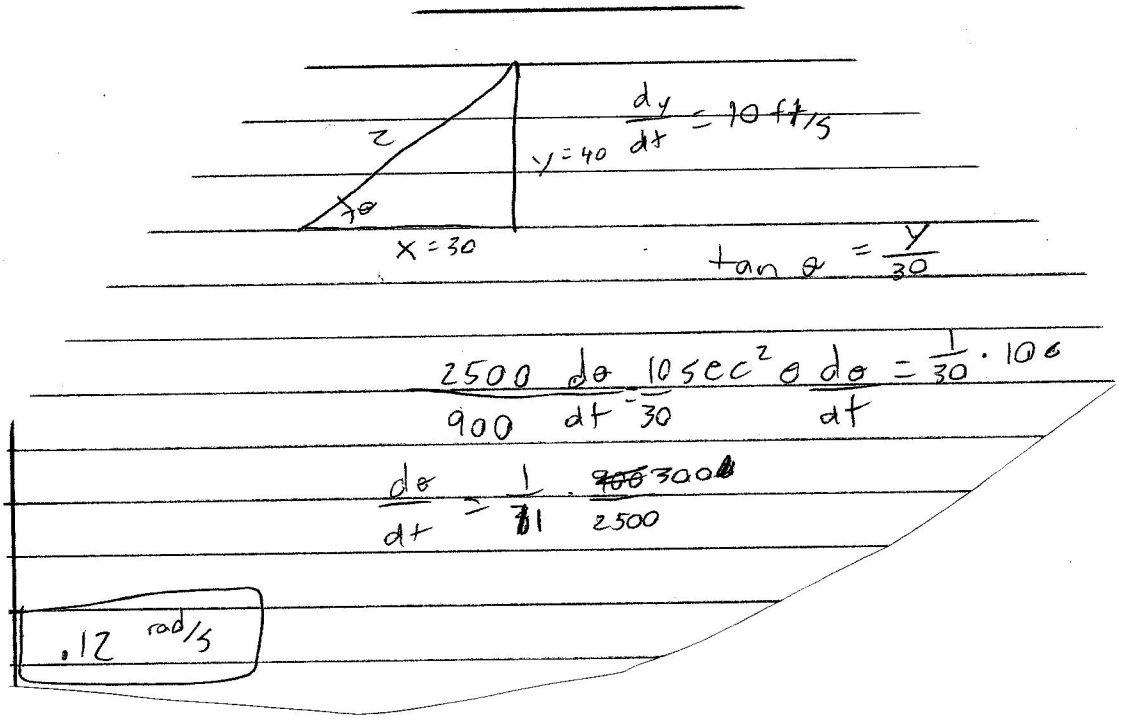
$\sec^2\theta = \frac{290000}{500^2}$

$\frac{290000}{500}\frac{d\theta}{dt} = -10$

$\frac{d\theta}{dt} = \frac{-5000}{290000} = -.017$ rad/min

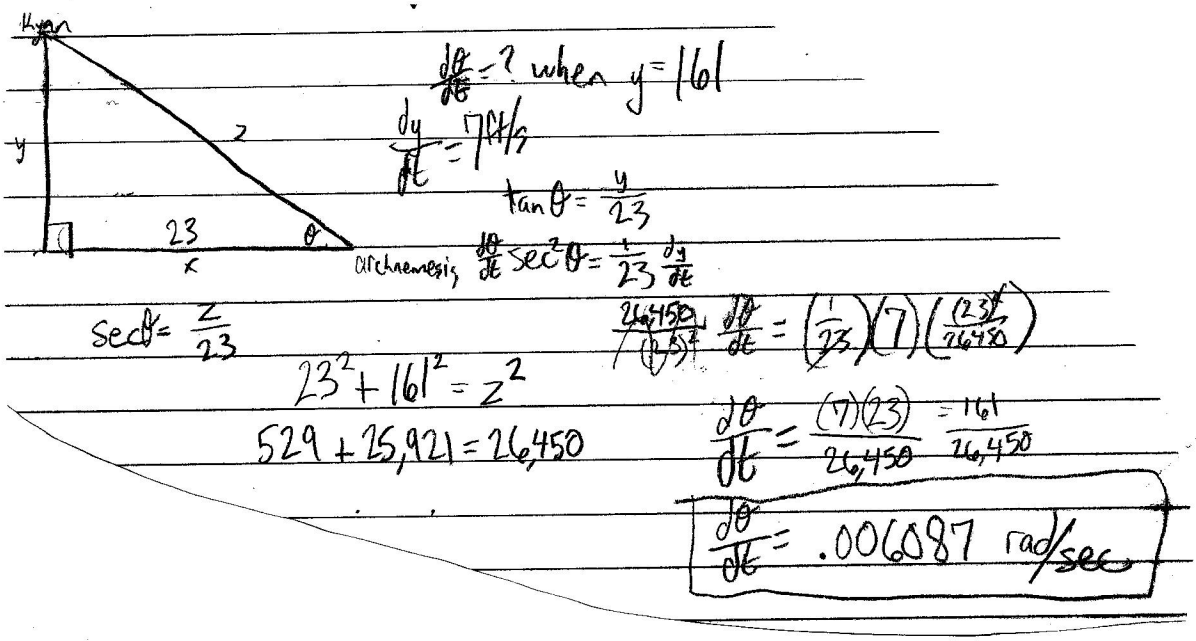
#3 Addison Ross

Trevor is currently falling from a building at a rate of 10 feet per second. If Michael is watching him fall from his car 30 feet away, what is the rate of change of the angle of elevation from Michael to Trevor when Trevor is 40 feet away from hitting the ground.



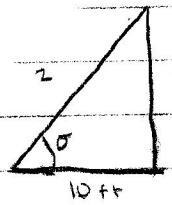
#3 Ryan Elmquist

Ryan is a super human with jumping abilities. If his arch nemesis is standing on on the ground 23 feet away, and Ryan jumps at a constant rate of 7 feet per second (disregarding the effects of gravity because they are on Uranus), what is the rate of change of the angle of elevation of Ryan from his arch nemesis, when Ryan is 161 feet off the ground?



#3 Trent Lux

A balloon is rising straight up at a rate of 5 ft/sec. A dog is 10 ft away watchnig the balloon go up. At what rate of change of the angle of the dog's eyes when the balloon is 100 ft off the ground?



$\frac{dy}{dt} = 5 ft/sec$

$\frac{d\theta}{dt} = ?$

$\tan\theta = \frac{y}{10}$

$\sec^2\theta \frac{d\theta}{dt} = \frac{1}{10}\frac{dy}{dt}$

$\left(\frac{\sqrt{10,100}}{10}\right)^2 \frac{d\theta}{dt} = \frac{5}{10}$

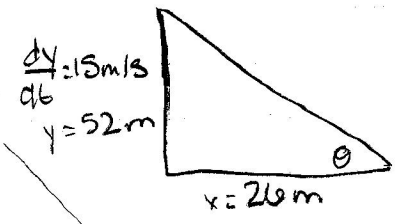
$\frac{d\theta}{dt} = \left(\frac{5}{10}\right)\left(\frac{10}{\sqrt{10,100}}\right)^2$

$\frac{d\theta}{dt} = \left(\frac{5}{10}\right)\left(\frac{100}{10,100}\right)$

$\frac{d\theta}{dt} = 0.00495\ ft/sec$

#3 Stephanie Schneider

Superman set down Mr. Duhrkopf after saving him from a mob of calculus students. Superman did a hero-walk and then flew straight up into the air. Mr. Duhrkopf was 26 m from the spot Superman took off. Superman rose from the ground at the rate of 15 m/s. What is the rate of change of the angle of elevation of Superman, when he is 52 m off the ground.



$\frac{d\theta}{dt} = ?$ $y = 52m$

$\tan\theta = \frac{y}{26} \cdot \frac{dy}{dt}$

$\sec^2\theta = \frac{1}{26} \cdot 15$

$\sec\theta = \frac{3380}{26^2} = \frac{1}{26} \cdot 15$

$\frac{26 \cdot 15}{3380} = \frac{390}{3380}$

$\frac{d\theta}{dt} = 0.12\ m/s$

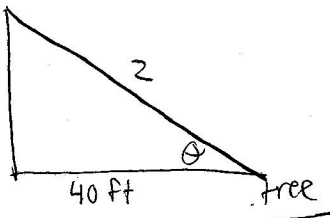
#3 Shannon O'Leary

Mr. Duhrkopf accidentally let go of his balloon. It is rising vertically at 30 feet/minute. When it is 200 feet up, what is the angle of elevation from the tree (40 feet away) to the balloon?

$(\sec\theta)^2 = \frac{z^2}{40^2}$

$\frac{dy}{dt} = 30$ ft/min

$40^2 + 200^2 = 41600$



$\frac{d\theta}{dt} = ?$ when $y = 200$ ft

$\tan\theta = \frac{y}{40}$

$\frac{d\theta}{dt}(\sec\theta)^2 = \frac{1}{40}\frac{dy}{dt}$

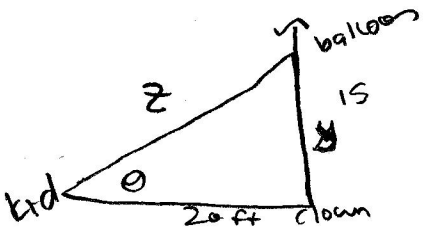
$\frac{d\theta}{dt}\frac{41600}{40^2} = \frac{1}{40} \cdot 30$

.029 rad/min

#3 Allison Baumhover

A kid wants to get a balloon from a clown who is standing 20 ft. away. As the kid stood in place and watched the clown hand out balloons, the clown released the last balloon, which started rising at a rate of 2 ft/second. What is the rate of change of the angle of elevation of the balloon as seen by the kid when the balloon is 15 feet off the ground?

$\frac{dy}{dt} = 2$ ft/sec when $y = 15$



$\frac{d\theta}{dt} = ?$

$\tan\theta = \frac{y}{20}$

$\sec\theta = \frac{z}{20}$

$z^2 = 625$

$\frac{d\theta}{dt}(\sec\theta)^2 = \frac{1}{20} \cdot \frac{dy}{dt}$

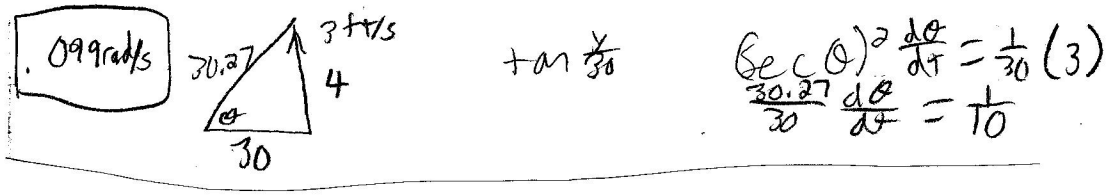
$\frac{d\theta}{dt} \cdot \frac{625}{400} = \frac{1}{20} \cdot \frac{2}{1}$

$\frac{d\theta}{dt} = \frac{.1}{625/400} = \frac{.1}{1.56}$

$= .064$ rad/sec

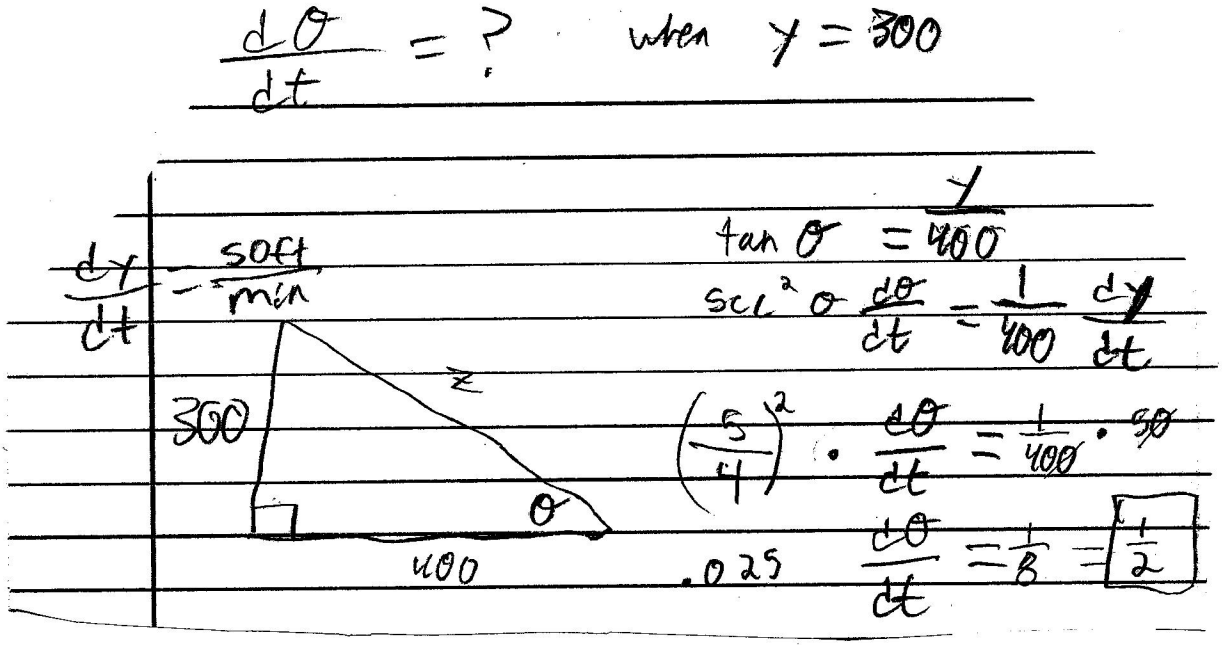
#3 Caleb Horsley

Addison Ross is playing in a basketball game at the Rec. He is attempting to dunk the ball and is jumping vertically at a rate of 3 ft/s. There is a spectator 30 ft away from Addison. How fast must the angle of the spectator change when Addison is 4 ft off the ground.



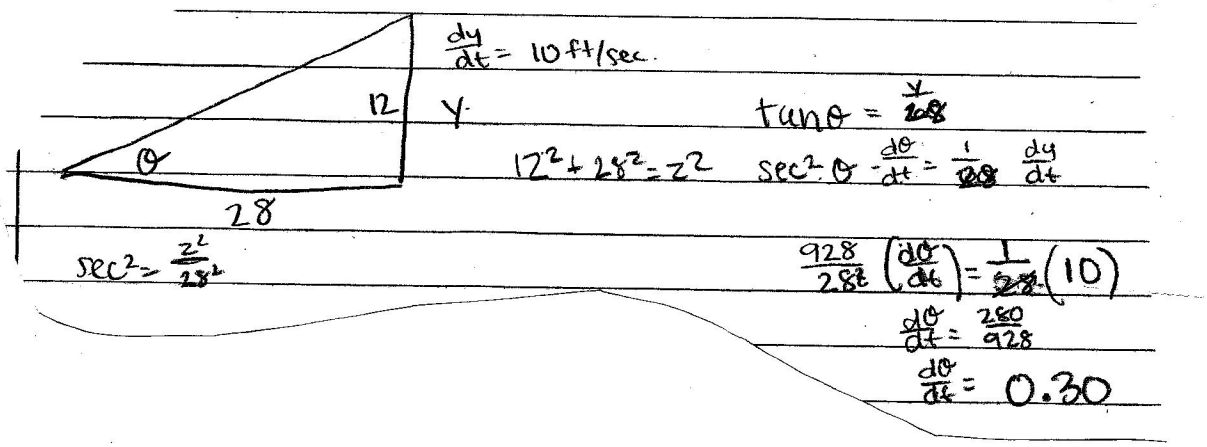
#3 Brent Wernimont

A hot air balloon is rising at a rate of 50 ft/min. When it is 300 feet up, what is the angle of elevation from a road 400 feet away from the hot air balloon.



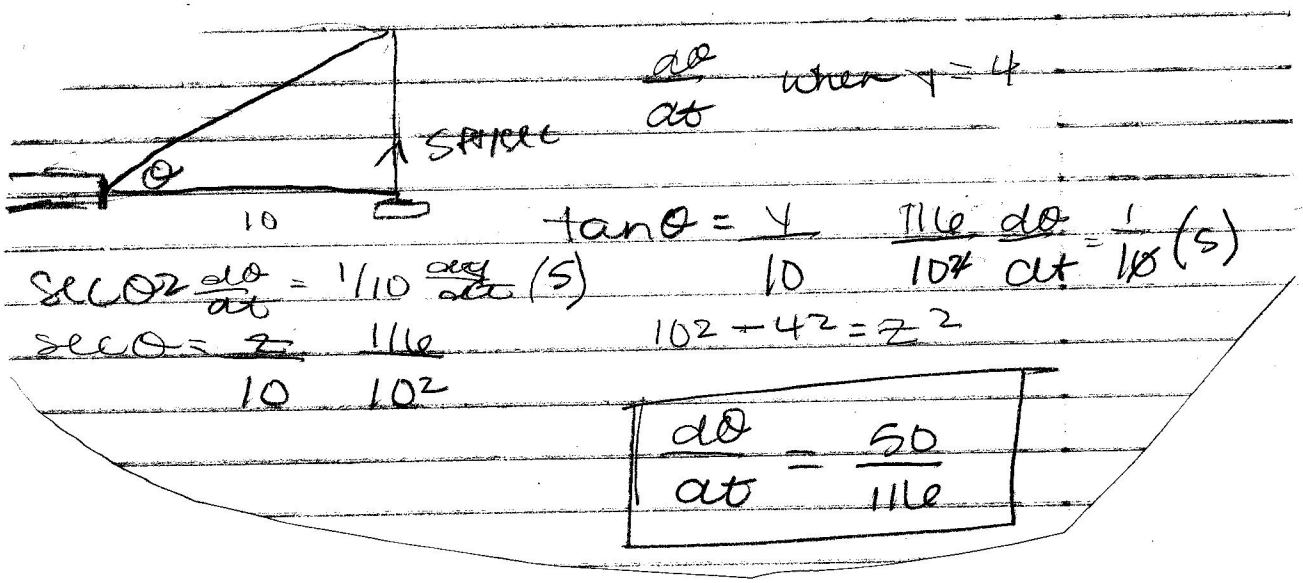
#3 Jessica Pottebaum

Duhrkopf is getting really mad. All of his hot air is making him rise at a rate of 10ft/sec from a point on the ground 28ft away from his students. What is the rate of change of the angle of elevation when Duhrkopf is 12ft above ground?



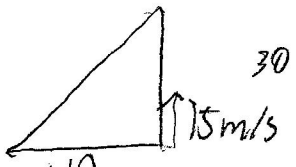
#3 Emily Peters

Kennedy's POS bug breaks down on her way to Sam's house one night. Being the nice person she is, Emily rushes to her aide. She brings along a jack. The jack rises at a rate of 5 ft/sec from a point on the ground 10 ft away from the curb. What is the rate of change of the angle of elevation when the jack is 4 ft above the ground?



#3 Alex Stenbo

Addison is on an elevator that is rising at 15 feet per minute. While Caleb is standing 40 feet away from the elevator. What is the rate of change of the angle of elevation of Addison when he is 30 feet high?



$\frac{d\theta}{dt} = ?$ when $y = 30$

$\tan\theta = \frac{y}{40}$

$\sec\theta^2 \cdot \frac{1}{40} \cdot 15$

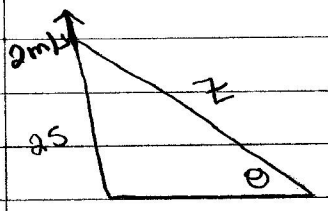
$\left(\frac{1250}{40}\right)^2 = \frac{1}{40} \cdot 15$

$\frac{2500}{40} = \frac{1}{40} \cdot 15$

$\frac{2500}{40} = 15$ $\quad \frac{15 \cdot 4}{250} = .24 \text{ rad/sec}$

#3 Abby Murrane

Breanna decided it would be fun to climb into a tree to get an apple at the top. Lauren ties a rope around Breanna and stands 10 m away from the tree. Breanna is climbing at 2 m per second. What is the rate of change of the angle of elevation of Breanna when she is 25 m off the ground.



$\frac{d\theta}{dt}$ when $y = 25m$

$\tan\theta = \frac{y}{10}$

$\sec\theta^2 \frac{d\theta}{dt} = \frac{1}{10}(2)$

$10^2 + 25^2 = z^2$

$100 \quad 625 \quad 725$

$\sec\theta = \frac{z}{10}$

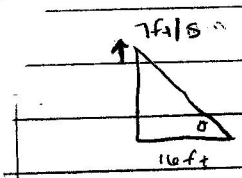
$\frac{725}{10^2} \frac{d\theta}{dt} = \frac{1}{10}(2)$

$\frac{d\theta}{dt} = \frac{20}{725}$

$.028 \text{ r/s}$

#3 Breanna Kroeger

Lauren is climbing a ladder at a rate of 7 feet per second. If Abby is standing 16 feet away, what is the rate of change of the angle of elevation when Lauren is 14 feet up?



$\frac{d\theta}{dt}$ when $y = 14$

$\tan\theta = \frac{y}{14}$

$\sec^2\theta \frac{d\theta}{dt} = \frac{1}{14}\frac{dy}{dt}$

$14^2 + 16^2 = z^2$

$= 452$

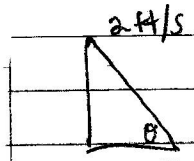
$\frac{452}{256}\frac{d\theta}{dt} = \frac{1}{15}(14)$

$1.77\frac{d\theta}{dt} = 0.93$

$\frac{d\theta}{dt} = 0.525$ rad/s

#3 Lauren Janning

Abby jumps at 2 feet per second while Breanna watches from 15 feet away. What is the rate of change of the angle of elevation of Abby when she is 7 feet high.



$\frac{d\theta}{dt}$ when $y = 7$

$\tan\theta = \frac{y}{15}$

$\sec^2\theta \frac{d\theta}{dt} = \frac{1}{15}\frac{dy}{dt}$

$\frac{274}{225}\frac{d\theta}{dt} = \frac{1}{15}(2)$

$7^2 + 15^2 = z^2$

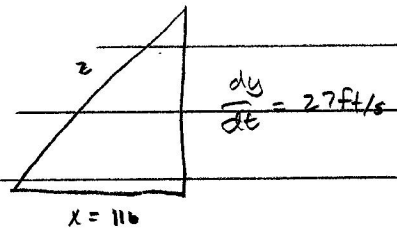
$49 + 225 = 274$

$1.22\frac{d\theta}{dt} = 0.133$

$\frac{d\theta}{dt} = 0.109$ rad/s

#3 Zena Olberding

A kite is rising vertically at 27 feet per second. The monkey is 116 feet away, so what is the rate of change of the angle of elevation of the kite when it is 48 feet off the ground.



$\frac{d\theta}{dt} = ?$ @ $y = 48$

$\tan\theta = \frac{y}{116}$

$\sec^2 = \frac{15760}{116^2}$

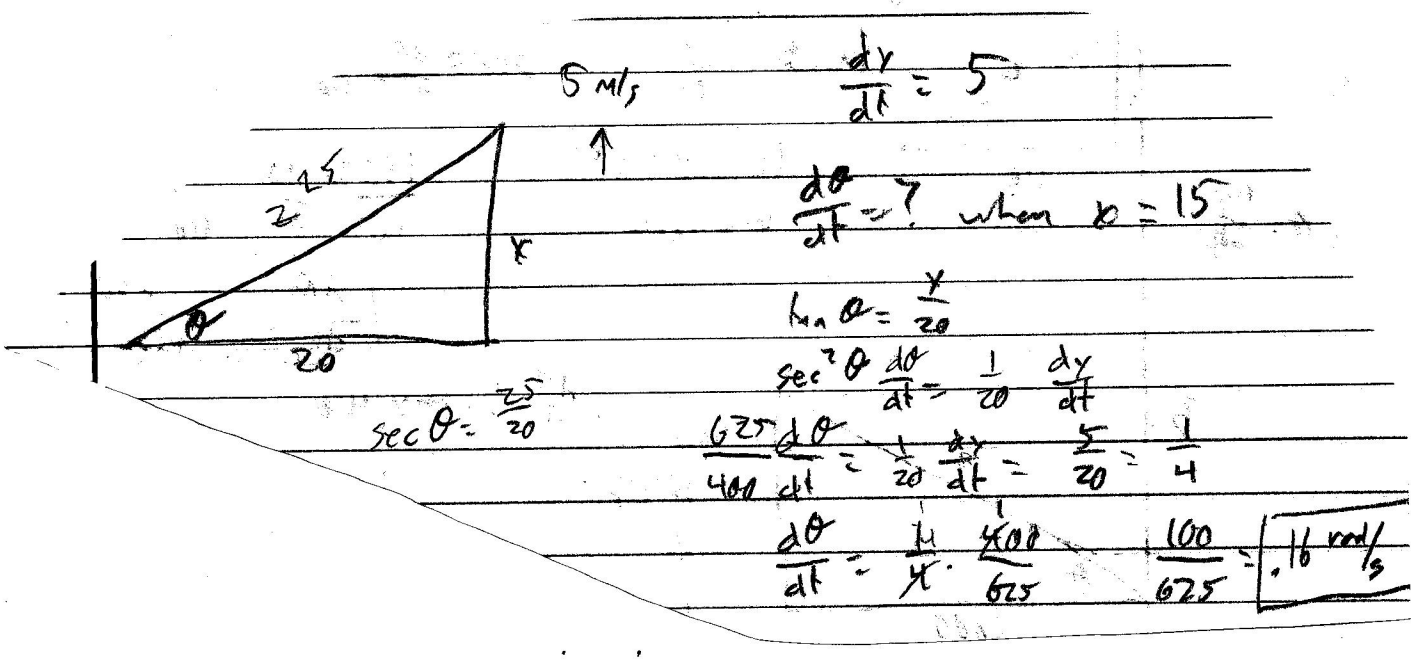
$(\sec\theta)^2 \frac{d\theta}{dt} = \frac{1}{116}\frac{dy}{dt}$

$\frac{15760}{116^2}\left(\frac{d\theta}{dt}\right) = \frac{1}{116}(27)$

$\frac{d\theta}{dt} = .199$ rad/s

#3 Colton Thompson

Arnie is climbing the water tower at a rate of 5 meters per second. If Gilbert is standing 20 meters away and watching him climb, what is the rate of change of the angle of elevation from Gilbert to Arnie when Arnie is 15 meters up.



$\frac{dy}{dt} = 5$

$\frac{d\theta}{dt} = ?$ when $x = 15$

$\tan\theta = \frac{x}{20}$

$\sec^2\theta \frac{d\theta}{dt} = \frac{1}{20}\frac{dy}{dt}$

$\sec\theta = \frac{25}{20}$

$\frac{625}{400}\frac{d\theta}{dt} = \frac{1}{20}\frac{dy}{dt} = \frac{5}{20} = \frac{1}{4}$

$\frac{d\theta}{dt} = \frac{4}{x}\cdot\frac{400}{625}$ $\frac{100}{625} = .16$ rad/s