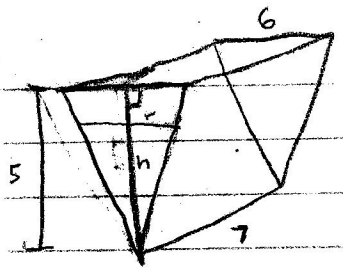
#4 Trent Lux

A pool, designed by Alex Stenbo, is in the shape of a triangular prism because he has no clue what he is doing. It is 5 feet deep, 7 feet long, and 6 feet across. It is being filled up at a rate of 2 cubic feet per min. How fast is the water level rising when the water is 4 feet deep.



$\frac{dv}{dt} = 2\ ft^3/min \quad \frac{dh}{dt} = ? \quad h = 4$

$\frac{r}{6} = \frac{h}{5} \quad r = \frac{6h}{5}$

$V = bh$

$V = (\frac{1}{2} r h)\,7$

$V = \frac{1}{2}(\frac{6h}{5})(h)\,7$

$V = \frac{6}{10}(h^2)\,7$

$V = \frac{42}{10} h^2$

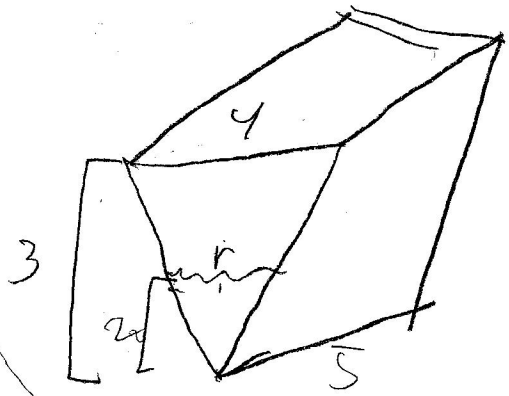
$\frac{dv}{dt} = \frac{84}{10} h \frac{dh}{dt}$

$2 = \frac{84}{10}(4)\frac{dh}{dt}$

$\frac{dh}{dt} = 0.0595\ ft/min$

#4 Alex Stenbo

Trent Lux decides to try to make a better pool, but fails and makes a pool in a smaller triangular prism. It is 3 feet deep, 5 feet long, and 4 feet across the top. It is being filled up at a rate of .5 cubic feet per min. How fast is the water level rising when the water is two feet deep.



$\frac{1}{2} h \cdot 5$

$V = \frac{5}{2} r h$

$V = \frac{5}{2} \frac{4}{3} h \cdot h$

$V = \frac{20}{6} h^2$

$\frac{dV}{dt} = \frac{40}{6} h \frac{dh}{dt}$

$\frac{1}{2} = \frac{40}{6} \cdot 2 \frac{dh}{dt}$

$\frac{1}{2} = \frac{80}{6} \frac{dh}{dt}$

$\frac{6}{80} \cdot \frac{1}{2} = \frac{dh}{dt}$

$\frac{3}{80} = \frac{dh}{dt}$

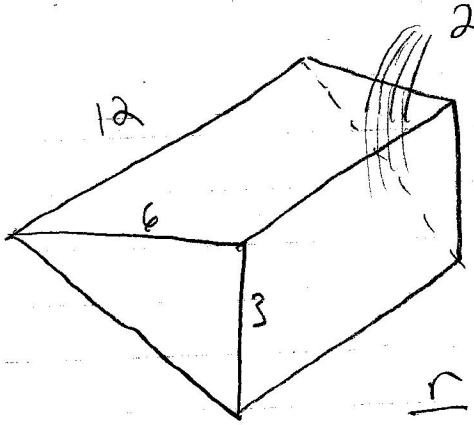
$\frac{dh}{dt} = ?$ when $h = 2$

$\frac{r}{4} = \frac{h}{3} \quad 3r = 4h \quad r = \frac{4}{3} h$

$\frac{3}{80}$ feet per sec

#4 Jessica Cheney

Jessica is making a giant batch of delicious lemonade! She starts pouring the water into her special lemonade container at a rate of 2 cubic inches per second. The container is 12 inches across the top, 6 inches wide, and 3 inches tall. At what rate will the height of the water be rising when the depth of the water is 1.5 inches?



$2\ in^3/s$

$\frac{dV}{dt} = 2\ in^3/s$

$\frac{dh}{dt} = ?$ when $h = 1.5$

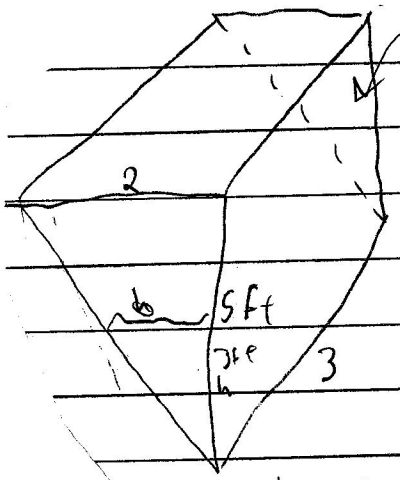
$V = \frac{1}{2}hr \cdot 12 \quad V = 6hr$

$\frac{r}{6} = \frac{h}{3} \quad r = 2h \quad V = 12h^2$

$\frac{dV}{dt} = 24h\frac{dh}{dt} \quad \frac{2}{24(1.5)} = .056\ in/s$

#4 Sterling Schaefer

Bill is filling a water tank in the shape of a triangular prism. The dimensions are 3ft across the top, 2ft wide, and 5ft tall. water is being pumped in at 2 cubic ft per minute. how fast will the water be rising when the water level is 3ft deep.



$2\ ft^3/min$

$V = \frac{1}{2}bh \cdot 3$

$V = \frac{3}{2}bh$

$V = \frac{3}{5}h^2$

$\frac{dV}{dt} = \frac{6}{5}h\frac{dh}{dt}$

$2 = \frac{6}{5}(3)\frac{dh}{dt}$

$\frac{b}{2} = \frac{h}{5}$

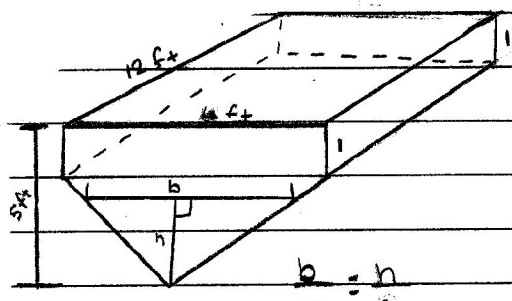
$b = \frac{2}{5}h \quad \frac{5}{6}\ \frac{2}{3} = \frac{6}{5}\frac{dh}{dt}$

$\frac{10}{18} = \frac{dh}{dt}$

$\frac{5}{9} = \frac{dh}{dt}$

#4 Breanna Kroeger

Keith Janning is filling a hot tub because baby girl and all of her friends are coming over. The hot tub is 12 feet across, 6 feet wide, and 5 feet deep. If the water is flowing into the hot tub at a rate of 4 cubic feet/min, find the rate of change of the depth of the water when the water is 3 feet deep.



$\frac{dV}{dt} = 4 \quad \frac{dh}{dt} = ? \text{ when } h = 3$

$V = \frac{1}{2}bh(12) \quad V = \frac{36}{4}h^2$

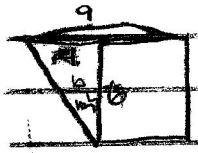
$\frac{b}{6} = \frac{h}{4} \quad \frac{dV}{dt} = \frac{72}{4}h\frac{dh}{dt}$

$b = \frac{6h}{4} = \frac{3h}{2} \quad 4 = 18(3)\frac{dh}{dt} \quad 4 = 54\frac{dh}{dt} \quad \frac{4}{54} = \frac{dh}{dt}$

$= 0.074 \text{ rad/min}$

#4 Jessica Pottebaum

A pool is 9 feet long, 4 feet across, and 6 feet high. If water is being pumped into the pool at 5 cubic feet per minute. How fast is the water level rising when the water is 5 feet deep?



$\frac{dV}{dt} = 5 ft^3/min \quad h = 5 ft$

$\frac{4}{b} = \frac{6}{h} \quad 6b = 4h$

$b = \frac{2h}{3} \quad \frac{1}{2}bh \cdot 9$

$\frac{1}{2}\left(\frac{2h}{3}\right)h \cdot 9$

$\frac{2}{6}h^2 \cdot 9 \quad \frac{18}{6}h^2$

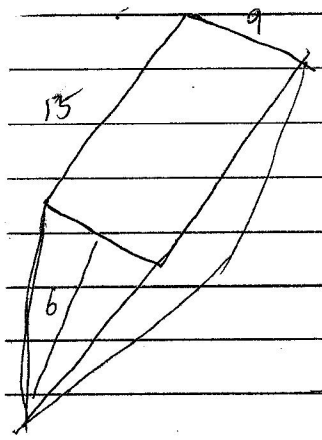
$5 = 3(5)^2\frac{dh}{dt}$

$5 = 75\frac{dh}{dt}$

$\frac{dh}{dt} = 0.06$

#4 Addison Ross

Alex Stenbo is very hungry and wants a lot of vanilla pudding. He starts pouring vanilla pudding into a triangular prism trough at a rate of 4 cubic feet per minute. The trough is 15 feet long, 9 feet across, and 6 feet deep. What is the rate of change of the pudding when it is 3 feet high.



$\frac{dV}{dt} = 4\ ft^3/min$ $\frac{dh}{dt} = ?$ $h = 3$

$V = bh$

$V = (\frac{1}{2}bh)\,15$

$V = \frac{1}{2}(1.5h)(h)\,15$

$V = 11.25h^2$

$\frac{b}{9} = \frac{h}{6}$ $b = 1.5h$

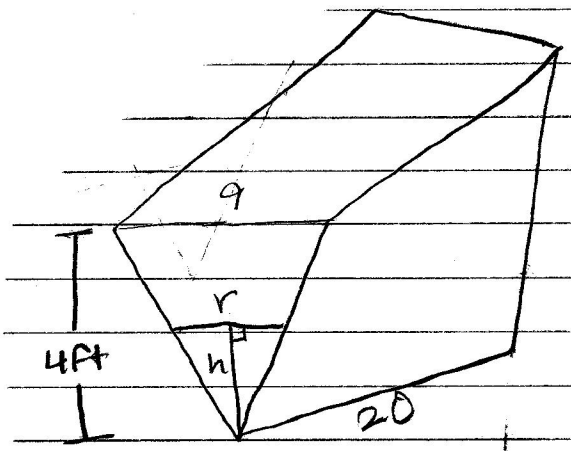
$\frac{dV}{dt} = 22.5h\frac{dh}{dt}$

$4 = 22.5(3)\frac{dh}{dt}$

$\frac{dh}{dt} = .533\ ft/min$

#4 Emily Peters

Tristin is doing pig chores after school one day. He turns on the automatic feeders while he power washes the pens. The food is filling the troughs at 2 cubic inches per second. The trough is 4 feet deep and the shape of a triangular prism. It is 20 feet long and 9 feet across. Find the rate of change of the depth of the pig food when it is 3 feet deep.



$\frac{dh}{dt}$ when $h = 3$

$V = \frac{1}{2}rh \cdot 20$

$V = 10rh$

$\frac{r}{9} = \frac{h}{4}$ $r = \frac{9h}{4}$

$V = 10(\frac{9h}{4})h$

$V = 90/4\,h^2$

$\frac{dV}{dt} = \frac{180}{4}h\frac{dh}{dt}$

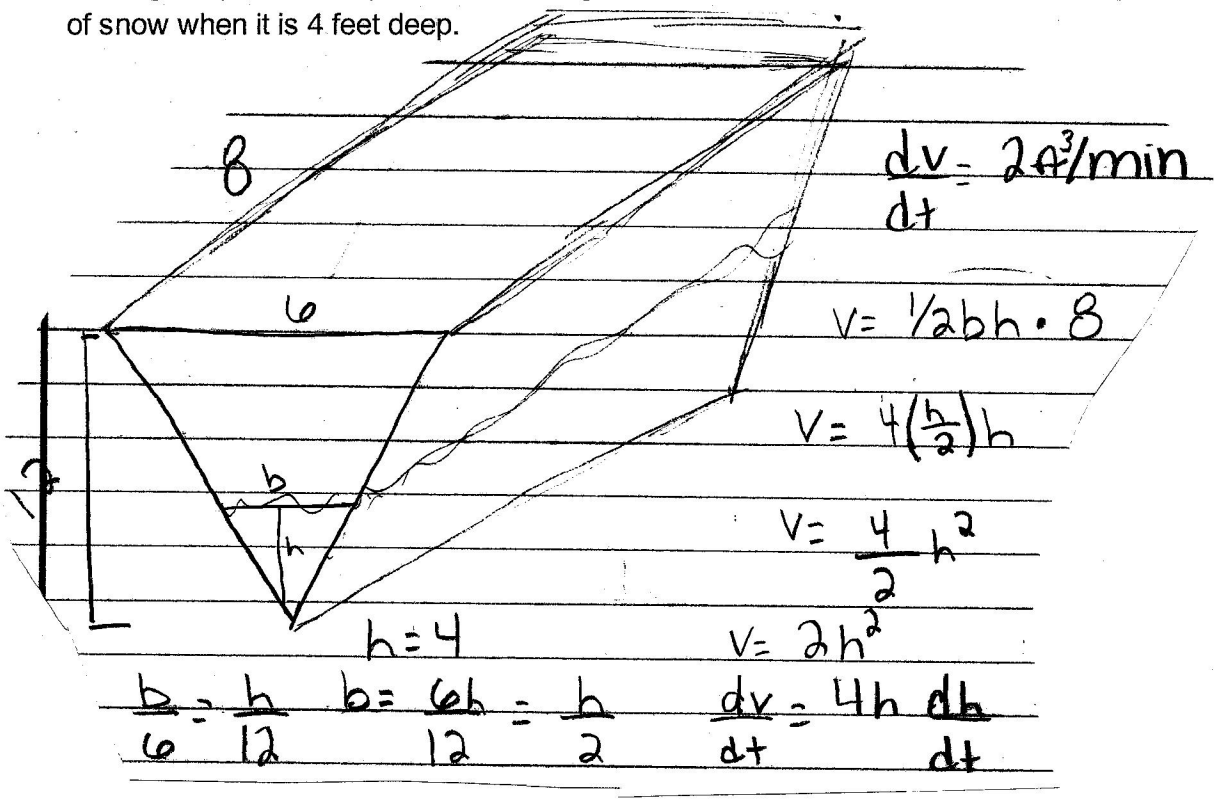
$2 = 180/4\,(3)\frac{dh}{dt}$

$2 = 540/4\frac{dh}{dt}$

$\frac{2}{1} \cdot \frac{4}{540} = \frac{8}{540}$ $\frac{dh}{dt} = 0.0148\ in^3/sec.$

#4 Kennedy Reid

The Carroll pool is being filled with snow at 2 feet per minute. The pool is 12 feet deep and in the shape of a triangular prism. The pool is 8 feet long and 6 feet across. Find the rate of change of the depth of the pool of snow when it is 4 feet deep.



$\frac{dV}{dt} = 2\,ft^3/min$

$V = \frac{1}{2}bh \cdot 8$

$V = 4\left(\frac{h}{2}\right)h$

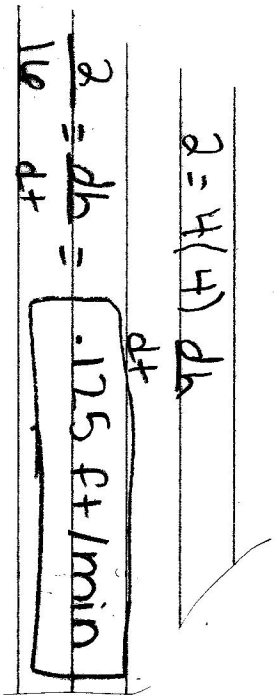
$V = \frac{4}{2}h^2$

$V = 2h^2$

$h = 4$

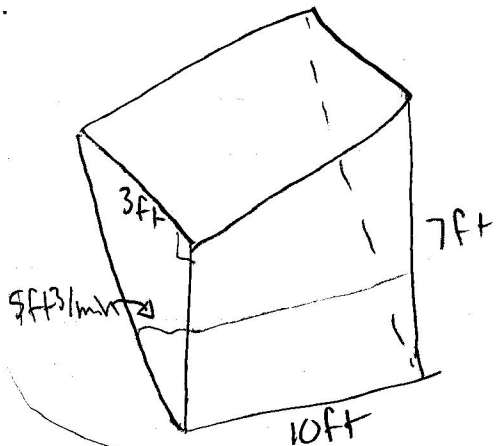
$\frac{b}{6} = \frac{h}{12} \quad b = \frac{6h}{12} = \frac{h}{2}$

$\frac{dV}{dt} = 4h\frac{dh}{dt}$



#4 Shannon O'Leary

A trough is 10 feet long, 3 feet across, and 7 feet high. If Allison is pumping water into the trough at 5 cubic feet per minute, how fast is the water level rising when the water is 3 feet deep? The trough is a triangular prism.



$\frac{dV}{dt} = 5\,ft^3/min$ $\quad \frac{dh}{dt} = ?$ when $h = 3ft$

$V = \frac{1}{2}bh \cdot 10$

$V = 5\frac{3}{7}h^2$

$\frac{dV}{dt} = 10 \cdot \frac{3}{7}h\frac{dh}{dt}$

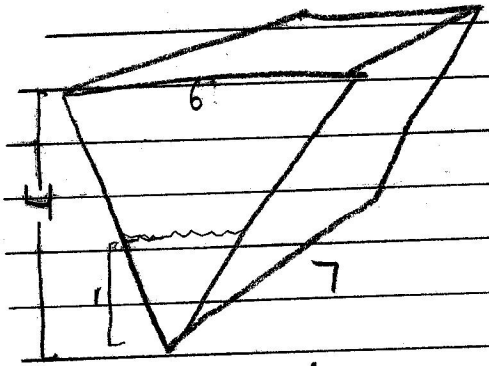
$5 = 10 \cdot \frac{3}{7} \cdot 3 \cdot \frac{dh}{dt}$

$\frac{dh}{dt} = .39\,ft^3/min$

$\frac{b}{3} = \frac{h}{7} \quad b = \frac{3}{7}h$

#4 Colton Thompson

Ben left his windows open during the football game while it rained. Let's assume the cab is a triangular prism that is 6 feet wide, 4 feet tall, and 7 feet long. If the rain got into the truck at a rate of 3 cubic feet per minute, how fast is the level of the water rising when it is a foot deep? (Extra Credit: How long will it take for Tracey to find out and take the truck away?)



$\frac{dV}{dt} = 3 ft^3/min$

$\frac{dh}{dt} = ?$ when $h = 1$

$V = \frac{1}{2} h \cdot r \cdot 7$

$V = \frac{7}{2} h \left(\frac{3h}{2}\right)$

$V = \frac{21}{4} h^2$

$\frac{dV}{dt} = \frac{21}{2} h \frac{dh}{dt}$

$3 = \frac{21}{2}(1)\frac{dh}{dt}$

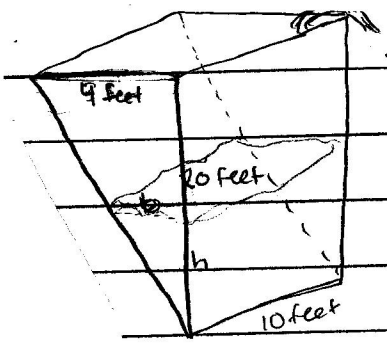
$\frac{r}{h} = \frac{6}{4}$

$r = \frac{6h}{4} = \frac{3h}{2}$

$\frac{5}{21} ft/min = \frac{dh}{dt}$

#4 Stephanie Schneider

A trough is 10 feet long, 3 feet across the top, and 20 feet high. If water is being pumped into the trough at 4 cubic feet per minute, how fast is the water level rising when the water is 6 feet deep?



$3 ft^3/min = \frac{dV}{dt}$ $\quad \frac{dh}{dt} = ?$ $h = 6$

$V = (\frac{1}{2}bh) \cdot 10$

$V = \frac{1}{2} \cdot (\frac{h}{5}) h \cdot 10$

$V = \frac{10}{10} h^2$

$\frac{dV}{dt} = 2h \frac{dh}{dt}$

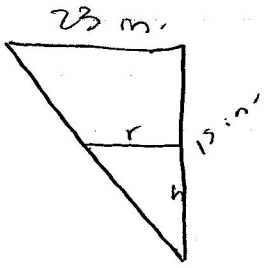
$\frac{b}{4} = \frac{h}{20}$ $\quad b = \frac{h}{5}$

$3 = 2(6)\frac{dh}{dt}$

$\frac{dh}{dt} = \frac{1}{4} ft^3/min$

#4 Allison Baumhover

A farmer is filling a trough of Dr. Pepper for his cows. The trough is 23 inches across the top, 20 inches wide, and 15 inches high. If the Dr. Pepper is being poured into the trough at 150 cubic feet per minute, how fast is the pop level rising when the pop is 10 inches tall? The trough is a triangular prism.



$V = \frac{1}{2} \cdot h \cdot 20$

$= \frac{1}{2}\left(\frac{23h}{15}\right) \cdot 20h$

$V = \frac{460}{30} h^2$ or $\frac{46}{3} h^2$

$\frac{r}{23} = \frac{h}{15}$

$r = \frac{23h}{15}$

$\frac{dV}{dt} = \frac{92}{3} h \frac{dh}{dt}$

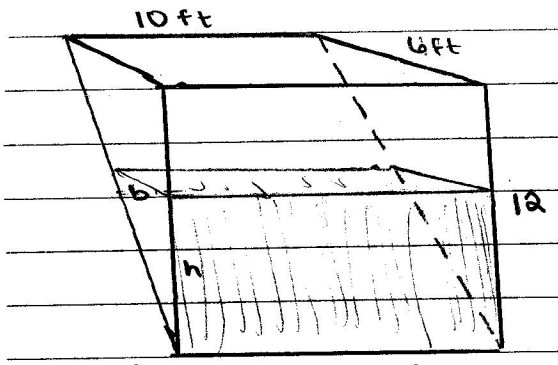
$150 = \left(\frac{92}{3}\right)(10) \frac{dh}{dt}$

306.67

$= -.489 \text{ ft}^3/\text{sec}$

#4 Abby Murrane

A trough is 10 ft long, 6 ft across the top, and 12 ft high. If corn is being dumped into the trough at 2 cubic ft per minute, how fast is the water level rising when the corn is 6 ft deep?



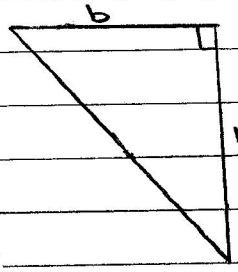
$\frac{dh}{dt} = ?$ $h = 6$ ft

$V = bh$

$V = \left(\frac{1}{2}bh\right) \cdot 10$

$V = \frac{1}{2}\left(\frac{h}{2}\right)h \cdot 10$

$V = \frac{5}{2} h^2$



$2 \text{ ft}^3/\text{min} = \frac{dV}{dt}$

$\frac{dV}{dt} = 5h \frac{dh}{dt}$

$2 = 5(6) \frac{dh}{dt}$

$\frac{b}{6} = \frac{h}{12}$

$\frac{1}{15} = \frac{dh}{dt}$

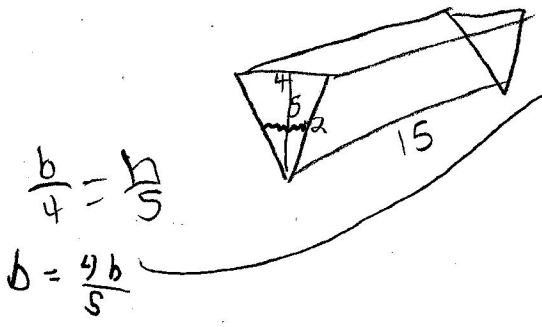
$b = \frac{h}{2}$.

or

$.067 = \frac{dh}{dt}$

#4 Caleb Horsley

A farmer decides to feed his cows milk in a triangular trough and is pouring in the milk at a rate of 3 cubic ft per minute. The trough is 15 ft long, 4 ft across, and 5 ft deep. How fast is the water level rising when the milk is 2 ft deep.



$\frac{b}{4} = \frac{h}{5}$

$b = \frac{4h}{5}$

$\frac{dV}{dt} = 3 ft^3/min$

$V = \frac{1}{2} bh(15)$ $V = \frac{60}{10} h^2$

$\frac{dV}{dt} = \frac{120}{10} h \frac{dh}{dt}$

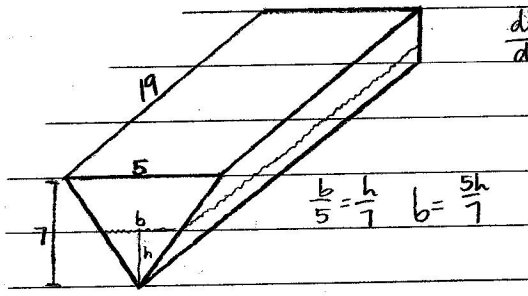
$3 = 12(5) \frac{dh}{dt}$

$\frac{3}{60} = \frac{dh}{dt}$

$.05 ft^3/sec$

#4 Lauren Janning

The drawer under the sink is in the shape of a triangular prism. Unfortunately, it is filling up with water from the broken faucet at 2 cubic inches per second. The drawer is 7 inches deep, 19 inches long, and 5 inches wide. Find the rate of change of the depth of the water when it is 3 inches deep.



$\frac{dV}{dt} = 2 in^3/s$

$V = \frac{1}{2} bh \cdot 19$

$V = \frac{1}{2}(\frac{5h}{7}) h \cdot 19$

$V = \frac{95}{14} h^2$

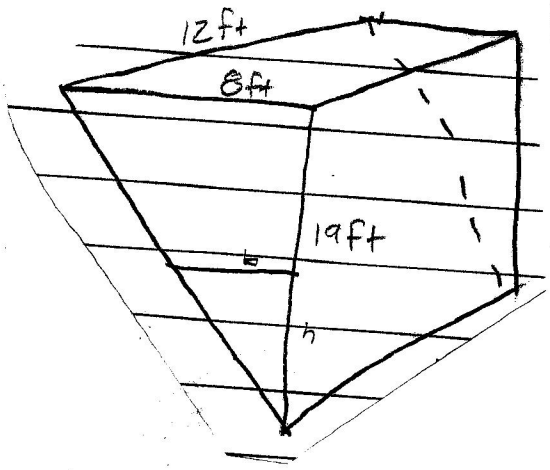
$\frac{b}{5} = \frac{h}{7}$ $b = \frac{5h}{7}$

$\frac{dV}{dt} = \frac{95}{7} h \frac{dh}{dt}$ $\frac{dh}{dt} = 0.049 rad/s$

$2 = \frac{95}{7}(3) \frac{dh}{dt}$

#4 Zena Olberding

A elephant is drinking water from a tank 12 feet long, 8 feet wide and 19 feet tall. If Dumbo the elephant is drinking the water at 23 cubic feet per second, find the rate of change of the depth of the water when it is 7 feet deep.



$\frac{dV}{dt} = 23 ft^3/s$

$\frac{dh}{dr} = ? \quad h = 7$

$\frac{b}{8} = \frac{h}{19}$

$V = \frac{1}{2} bh(12)$

$V = \frac{1}{2} \cdot \frac{8h}{19} h \left(\frac{12}{1}\right)$

$V = \frac{48}{19} h^2$

$\frac{dV}{dt} = \frac{48}{19}(h)^2 \frac{dh}{dt}$

$-23 = \frac{48}{49} 7^2 \frac{dh}{dt}$

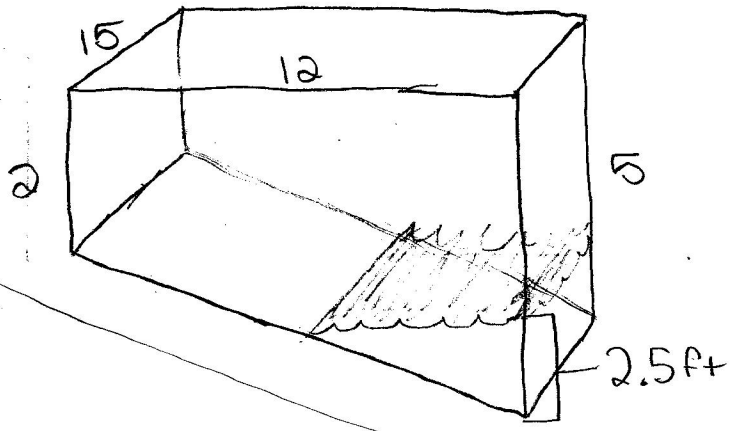
$\frac{dh}{dt} = -.479 ft/s$

#4 Brent Wernimont

Man on a Buffalo is filling up his triangular water tank at a rate of 4 cubic feet per minute. It is 9 feet tall 22 feet long and 15 feet across. How fast is the water level of the tank rising when the tank is 3 feet filled.

#4 Daric Teske

The shallow end of the REC Center needed to be drained (Don't ask why). One side is 2 ft deep and the other is 5 ft. The pool is 12 ft long by 15 ft wide. If 10 cubic ft is pumped back in per minute, how fast is the water height rising when the height is 2.5 ft above the deeper end.



$$\frac{b}{3} = \frac{h}{12}$$

$$b = \frac{1}{4}h$$

$$\frac{1}{2} b h D = V$$

$$\frac{1}{2}\left(\frac{1}{4}h\right) h \, 15 = V$$

$$\frac{15}{2} h^2 = V$$

$$15h \frac{dh}{dt} = \frac{dv}{dt}$$

$$15(2.5)\frac{dh}{dt} = 10$$

$$\frac{dh}{dt} = \frac{4}{15} = .267 \text{ ft/min}$$