$6y^2 + x^2 = 2 - x^3 e^{4-4y}$

$x=-2 \quad y=1 \quad x'=-4 \quad y'=?$

$12yy' + 2xx' = -3x^2x' e^{4-4y} + 4x^3 e^{4-4y} y'$

$12y' + 16 = 48e^0 + -32e^0 y'$

$12y' + 16 = 48 - 32y'$

$44y' = \frac{32}{44}$

$y' = \frac{8}{11}$

$x(1-y) + 5z^3 = y^2z^2 + x^2 - 3$

$x=4 \quad y=-2 \quad z=1 \quad x'=9 \quad y'=-3 \quad z'=?$

$x'(1-y) + x(-y') + 15z^2z' = 2yy'z^2 + 2zz'y^2 + 2xx'$

$9(1+2) + 4(3) + 15(1)(z') = 2(-2)(-3)(1) + 2(1)z'(4) + 2(4)(9$

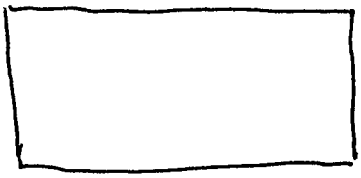
$9(3) + 4(3) + 15z' = 12 + 8z' + 72$

$27 + 12 + 15z' = 84 + 8z'$

$7z' = 45$

$z' = \frac{45}{7}$

For a certain rectangle, the length of 1 side is always 3 times the length of the other. If the shorter side is decreasing at 2"/min, at what rate is the ~~other~~ longer side decreasing?



$\ell = 3w$

$A = \ell w$ or $A = 3w^2$

combine into..

$\ell w = 3w^2$

$\ell = 3w$ Now take the derivative

$\ell' = 3w'$

$\ell' = 3(-2)$

$\ell' = -6$ in/min

* Decreasing at a rate of 6 in/min.

A sheet of ice is in the form of a circle. The ice is melting in such a way that the Area is decreasing at a rate of .5 m^2/sec. At what rate is the radius decreasing when the area is 12 m^2?

$A = \pi r^2$

$12 = \pi r^2$

$\frac{12}{\pi} = r^2$

$\frac{\sqrt{12}}{\sqrt{\pi}} = \frac{\sqrt{12\pi}}{\pi} = \boxed{\frac{2\sqrt{3\pi}}{\pi}}$

$A' = \pi 2 r r'$

$-.5 = 2\pi \frac{2\sqrt{3\pi}}{\pi} r'$

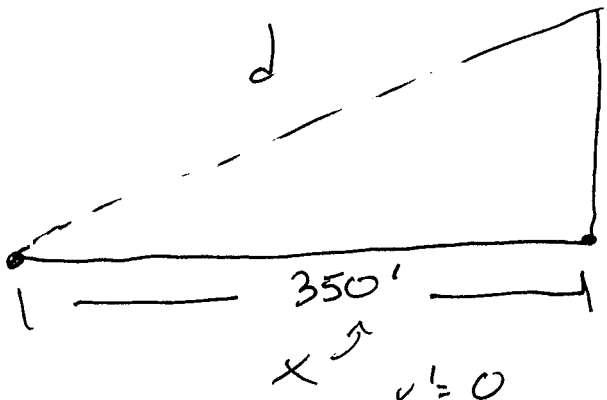
$-.5 = 4\sqrt{3\pi}\, r'$

$\frac{1}{4\sqrt{3\pi}} \cdot -\frac{1}{2} = 4\sqrt{3\pi}\, r' \cdot \frac{1}{4\sqrt{3\pi}}$

$r' = -\frac{1}{8\sqrt{3\pi}}$

$r' = -\frac{\sqrt{3\pi}}{24\pi}$

A person is standing 350 ft. away from a model rocket fired straight up at 15 ft/sec
At what rate is the distance between the person and the rocket increasing at (A) $t = 20$ sec (B) at 1 min after liftoff?



$\uparrow$ $15 \text{ ft/sec} = y'$

$x' = 0$ (not moving!)

(A) $t = 20$ sec

$d^2 = x^2 + y^2$

$d^2 = 350^2 + 300^2$

$d \approx 461$

$2d\,d' = 2x\,x' + 2y\,y'$

$2(461)\,d' = 2(300)(15)$

$d' = \frac{300 \cdot 15}{461}$

$d' \approx 9.76$ ft/sec

(B) $t = 60$ sec $\quad d^2 = x^2 + y^2$

$d^2 = 350^2 + 900^2$

$d \approx 966$ ft.

$2d\,d' = 2x\,x' + 2y\,y'$

$2(966)\,d' = 2(900)(15)$

$d' = \frac{900(15)}{966}$

$d' \approx 14$ ft/sec