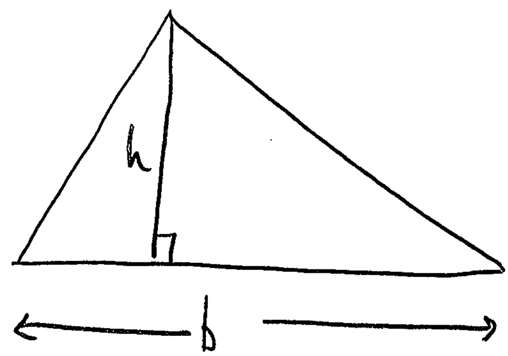
 Name: SOLUTIONS.

(1) [8] The altitude of a triangle is increasing at a rate of 1 cm/min while the area of the triangle is increasing at a rate of 2 cm^2/min. At what rate is the base of the triangle changing when the altitude is 10 cm and the area is 100 cm^2?



$$A = \frac{1}{2} bh.$$

$$\frac{dh}{dt} = +1 \frac{cm}{min}$$

$$\frac{dA}{dt} = +2 \frac{cm^2}{min}.$$

What is $\frac{db}{dt}$ when $h=10$ and $A=100$?

$$\frac{dA}{dt} = \frac{d}{dt}\left[\frac{1}{2} bh\right]$$

$$= \frac{1}{2}\left[\frac{db}{dt} \cdot h + b\frac{dh}{dt}\right]$$

When $h=10$, $A=100$, $b = \frac{2A}{h} = \frac{(2)(100)}{10} = 20$,

$$\therefore \quad 2 = \frac{1}{2}\left[\frac{db}{dt} \cdot 10 + 20 \cdot 1\right]$$

$$\frac{db}{dt} = \frac{4-20}{10} = \frac{-16}{10} \frac{cm}{min}$$

$\boxed{\therefore \text{ base is decreasing at } \frac{16}{10} \frac{cm}{min}.}$

 Name: SOLUTIONS.

(2) [3] Determine $\lim_{x\to 3^+} e^{2/(3-x)}$

As $x \to 3^+$, $3-x \to 0^-$, so $\frac{2}{3-x} \to -\infty$,

so $e^{\frac{2}{3-x}} \to 0$

$\therefore \boxed{\lim_{x\to 3^+} e^{\frac{2}{3-x}} = 0.}$

(3) [4] Determine the linear approximation (or linearization) $L(x)$ of $f(x) = 1/\sqrt{2+x}$ at $a = 0$.

$f(x) = \frac{1}{\sqrt{2+x}}$, $f(a) = f(0) = \frac{1}{\sqrt{2+0}} = \frac{1}{\sqrt{2}}$.

$f'(x) = \frac{d}{dx}\left[(2+x)^{-\frac{1}{2}}\right] = -\frac{1}{2}(2+x)^{-\frac{3}{2}}$;

$f'(a) = -\frac{1}{2}(2+0)^{-\frac{3}{2}} = -\frac{1}{2}\left(\frac{1}{2}\right)^{3/2} = \frac{-1}{4\sqrt{2}}$

$\therefore L(x) = f(a) + f'(a)(x-a)$

$$\boxed{L(x) = \frac{1}{\sqrt{2}} - \frac{1}{4\sqrt{2}}x}$$