$$\frac{(3x)^2y^4}{2x^{-3}y^5} \cdot \frac{(5x^{-2}y^5)^{-3}}{9x^7y^{-3}}$$

$$\frac{3^2x^2y^4}{2x^{-3}y^5} \quad x^{2-3}=x^{-1} \quad y^{4-5}=y^{-1} \quad \frac{5^{-3}x^6y^{-15}}{9x^7y^{-3}}$$

$$\frac{9x^5}{2y^1} \cdot \frac{1}{5^3 \cdot 1 \cdot x^1 y^{12}} \cdot \frac{y^3}{y^{15}} = \frac{x^4}{250y^{13}}$$

$$5^3 = 125$$

$$\frac{9x^5}{2 \cdot 5^3 \cdot 9 \; x^4 y^1 y^{12}}$$

$500 4.5% increase

$u_0 = 500$ $n \geq 1$

$u_n = (1 + 0.045) u_{n-1}$ > recursive

exponential equation $y = 500 \cdot 1.045^{-x}$

after 3 yrs 7 months $3\frac{7}{12} \approx 3.5833$

$y = 500 \cdot 1.045^{3.5833} \approx 585.54$

nth roots

is equivalent

$\sqrt[b]{x^a} \Leftrightarrow x^{a/b}$

$\sqrt[b]{x^a} \Rightarrow x^{\frac{a}{b}}$ ← power, ← root

$\sqrt[b]{x^a} = \left(\sqrt[b]{x}\right)^a$

$\sqrt[b]{x^a} \Leftarrow x^{a/b}$

radical form ⇑ ⇑ exponential form

$\sqrt[3]{x} = a$ means $a^3 = x$

$\sqrt[b]{x} = b \Rightarrow b^b = x$

$\sqrt[3]{x^6} = x^{\frac{6}{3}} = x^2$

$\sqrt[6]{x^3} = x^{\frac{3}{6}} = x^{1/2} = \sqrt{x}$

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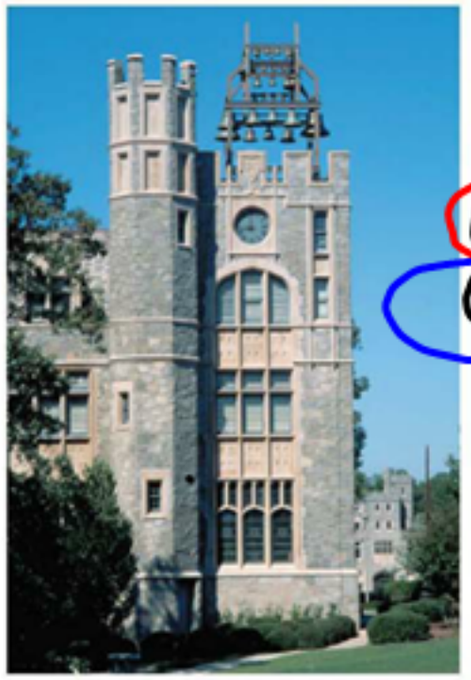
MPLE B

Casey hit the bell in the school clock tower. Her pressure reader, held nearby, measured the sound intensity, or loudness, at 40 lb/in² after 4 s had elapsed and at 4.7 lb/in² after 7.2 s had elapsed. She remembers from her science class that sound decays exponentially.

a. Name two points that the exponential curve must pass through.

b. Find an exponential equation that models these data.

c. How loud was the bell when it was struck (at 0 s)?



The bell tower at Oglethorpe University in Atlanta, Georgia.

x = time (s)

y = intensity lb/in²

(4, 40)

(7.2, 4.7)

b = ratio = $\frac{\text{now}}{\text{previous}}$

$y = a \cdot b^x$

(start value, $x=0$)

$y = y_1 \cdot b^{x-x_1}$

(point)

$y = 40 \cdot b^{x-4}$

$4.7 = 40b^{7.2-4}$

$4.7 = 40b^{3.2}$

$\frac{4.7}{40} = \frac{40b^{3.2}}{40}$

$\frac{4.7}{40} = b^{3.2}$

$\sqrt[3.2]{\frac{4.7}{40}} = b$ or $\left(\frac{4.7}{40}\right)^{\frac{1}{3.2}} = b$

$b \approx 0.5121$

$y = 40(0.5121)^{x-4}$

Simplify using the properties of exponents

$$\frac{(3x)^2 y^4}{2x^{-3}y^5} \cdot \frac{(5x^{-2}y^5)^{-3}}{9x^7 y^{-3}} = \frac{(3x)^2 y^4 x^3 y^3}{(5x^{-2}y^5)^3\, 2y^5\, 9x^7}$$

$$\frac{3^2 x^2 y^4 x^3 y^3}{5^3 x^{-6} y^{15}\, 2y^5\, 9x^7} = \frac{9}{125 \cdot 2 \cdot 9} \quad \frac{x^2 x^3 x^6}{x^7} \quad \frac{y^4 y^3}{y^{15} y^5}$$

x^{11} y^7 y^{20}

$y\,y\,y\,y \ldots$

$y\,y\,y \ldots$

$$\frac{x^{2+3+6}}{x^7} = \frac{x^{11}}{x^7} = x^{11-7} = x^4$$

$$\frac{x^4}{250\,y^{13}}$$

$$y^{7-20} = y^{-13} = \frac{1}{y^{13}}$$

y^{20-7}

Daphne found 70 bacteria in her waterbowl. at 8:00am
She knows that bacteria grows 15% per hour.
How many bacteria are in the bowl at 5:45 pm?

$u_0 = 70$

$u_n = (u_{n-1})(1 + 0.15), n \geq 1$

$y = 70(1.15)^x$ exp eqn.

5:45 pm $x = 9\text{hr } 45\text{min} = 9.75\text{ hr}$

$y = 70(1.15)^{9.75} = 273.46$

nth roots is equivalent

$\sqrt[b]{x^a} = \left(\sqrt[b]{x}\right)^a$

$\sqrt[b]{x^a} \iff x^{\frac{a}{b}}$

$\sqrt[b]{x^a} \Rightarrow x^{a/b}$

$\sqrt[b]{x^a} \Leftarrow x^{a/b}$

radical form

exponential form

$\sqrt[6]{x^3} = x^{3/6} = x^{1/2} = \sqrt{x}$

$\sqrt[3]{x^6} = x^{6/3} = x^2$

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The bell tower at Oglethorpe University in Atlanta, Georgia.

3:17 PM 12/8/2016

time | loud

x	y
4	40
7.2	4.7

Given exponential

$y = a \cdot b^x$ if a=yint ($x=0$)

$y = y_1 \cdot b^{x-x_1}$ point-ratio

$y = 40 b^{x-4}$

$4.7 = 40 \cdot b^{7.2-4}$

$\frac{4.7}{40} = \frac{40 b^{3.2}}{40}$

$\left(\frac{4.7}{40}\right)^{\frac{1}{3.2}} = \left(b^{3.2}\right)^{\frac{1}{3.2}}$

$b = \left(\frac{4.7}{40}\right)^{\frac{1}{3.2}}$

$b = 0.512$