F) $2(3^x) - 20 = 34$

$\frac{2(3^x)}{2} = \frac{54}{2}$

$3^x = 27$

$3^x = 3^3$

$x = 3$

G) $\sqrt[5]{8^{x-1}} = \sqrt[3]{16^x}$

$(8^{x-1})^{\frac{1}{5}} = (16^x)^{\frac{1}{3}}$

$8^{\frac{x-1}{5}} = 16^{\frac{x}{3}}$

$(2^3)^{\frac{x-1}{5}} = (2^4)^{\frac{x}{3}}$

$2^{\frac{3x-3}{5}} = 2^{\frac{4x}{3}}$

$\frac{3x-3}{5} = \frac{4x}{3}$

$$\frac{3x-3}{5} = \frac{4x}{3}$$

$$3(3x-3) = 5(4x)$$

$$9x-9 = 20x$$

$$-9 = 20x-9x$$

$$-9 = 11x$$

$$\frac{-9}{11} = x$$

Applications of Exponential Equations

the amount of time it takes for $\frac{1}{2}$ the substance to decay

1. The half-life of radon is 92 hours. If the initial amount was 48 g, how long will it take for the radon to decay to 3 g?

time (h) x	0	92	184	276	368	460
amount (g) y	48	24	12	6	3	1.5

PC II: Common ratio $= \frac{t_2}{t_1}, \frac{t_3}{t_2}, \frac{t_{n+1}}{t_n}$

$= \frac{24}{48}, \frac{12}{24}, \frac{6}{12}$

$= \frac{1}{2}, \frac{1}{2}, \frac{1}{2}$

$y = a(c)^{\frac{bx}{}}$

y = amount

x = time

c = common ratio

a = initial amount

b = time increment

$$y = 48\left(\frac{1}{2}\right)^{\frac{x}{92}}$$

When $y = 3$ what is x?

$$3 = 48\left(\frac{1}{2}\right)^{\frac{x}{92}}$$

$$\frac{3}{48} = \left(\frac{1}{2}\right)^{\frac{x}{92}}$$

$$\frac{1}{16} = \left(\frac{1}{2}\right)^{\frac{x}{92}}$$

$$\left(\frac{1}{2}\right)^{4} = \left(\frac{1}{2}\right)^{\frac{x}{92}}$$

$$4 = \frac{x}{92}$$

$$368 = x$$

2. Compound Interest

Balance – the money you have in the bank.

Principal – the balance on which the bank pays you interest

Compound Interest - After a set period of time, the interest is added to your account – then the next lot of interest is calculated on the higher balance.

Yearly – once a year

monthly – 12 x/yr

weekly – 52 x/yr

semi-monthly – 24 x/yr

bi-weekly – 26 x/yr

per year

Consider an investment of $500 with an interest rate of 7% per annum paid each year and compounded annually. once a year

After year	Interest paid	Account balance
0	0	500
1	7% of 500 = 35	500 + 35 = 535
2	7% of 535 = 37.45	37.45 + 535 = 572.45
3	7% of 572.45 = 40.07	612.52

CR: $\frac{535}{500}$, $\frac{572.45}{535}$

$= 1.07$

$100\% + 7\%$

$$A = P\left(1+\frac{r}{n}\right)^{nt}$$

A = the amount of money at the end of the investment
P = the principle amount invested
r is the interest rate yearly decimal
n is the number of compounding periods per year

Example: per year 2x/year

If I am able to invest 7.6% p.a. compounded semi-annually, how much should I invest NOW to achieve a maturing value of $10000 in 5 years time?

$A = 10000$
$P = ?$
$r = 0.076$
$n = 2$
$t = 5$

$$10000 = P\left(1+\frac{0.076}{2}\right)^{2(5)}$$
$$10000 = P(1.038)^{10}$$
$$10000 = P(1.4520)$$
$$P = \frac{10000}{1.4520}$$
$$P = \$6884.94$$

2. A cup of hot chocolate is served at an initial temperature of 80°C and then allowed to cool in a stadium with an air temperature of 5°C. The difference between the hot chocolate temperature and the temperature of the stadium will decrease by 30% every six minutes. If T represents the temperature of the hot chocolate in degrees Celsius, measured as a function of time, t, in minutes

A) give the equation of the relationship between temperature and time in the form $T = a(c)^{b(t-h)} + k$

time	HC temp	HC - stad
0	80	75
6	57.5°C	0.7 x 75 = 52.5
12	41.75°C	0.7 x 52.5 = 36.75

$T = a(c)^{bt} + 5$

$T = a(0.7)^{\frac{t}{6}} + 5$

at $t = 0$, $T = 80$

$80 = a(0.7)^0 + 5$

$80 = a + 5$

$a = 75$

$T = 75(0.7)^{\frac{t}{6}} + 5$

B) What is the temperature after 11 minutes?

$$T = 75(0.7)^{\frac{11}{6}} + 5$$

$$T = 44.00^{\circ}C$$

C) How long does it take the hot chocolate to cool to a temperature of 40°C?

$$40 = 75(0.7)^{\frac{t}{6}} + 5$$

$$\frac{35}{75} = (0.7)^{\frac{t}{6}}$$

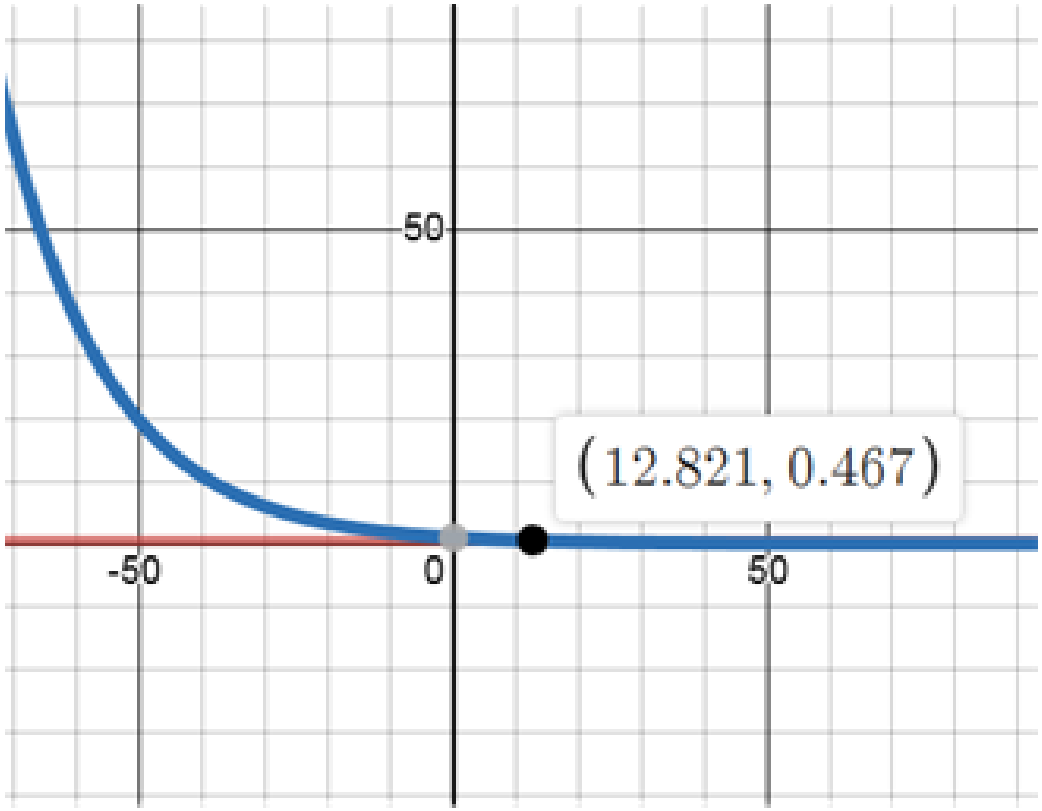
$$\frac{7}{15} = (0.7)^{\frac{t}{6}}$$

$$0.4666 = 0.7^{\frac{t}{6}}$$

Graph $y_1 = 0.4666$

$y_2 = 0.7^{\frac{t}{6}}$

It takes 12.82 minutes.


50
-50
0
50
(12.821, 0.467)

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WP → #9, 10, 12, 14

16, 17 ← Do these Yummies :)

+

Sheet