WA5 sols

+34/34

1 | @ $3^{t-1} = 14$

18/18

$t - 1 = \log_3(14)$ } work: +1

$t = 1 + \log_3(14) = 1 + \frac{\ln(14)}{\ln(3)} \approx 3.402.$

+2, or something equivalent.

(b) $3 - 10^{2-t} = 1$

$2 = 10^{2-t}$ } +1 work

$\log_{10}(2) = 2 - t$

$t = 2 - \log_{10}(2) \approx 1.699$

+2

(c) $\log_2(4 - r) = -3$ } +1 work

$4 - r = 2^{-3}$ +2

$r = 4 - 2^{-3} = 3.875$

(d) $\ln(t) + \ln(t+2) = 2$

work +1

$\ln(t(t+2)) = 2$

$t(t+2) = e^2$

$t^2 + 2t - e^2 = 0$

$t = \frac{-2 \pm \sqrt{4 - 4(1)(-e^2)}}{2}$

$t = \frac{-2 \pm \sqrt{4 + 4e^2}}{2}$

$t = 1.896$ or -3.896

but t can't be negative

($\ln(-3.896)$ doesn't make sense)

+2 so $t = 1.896$ is the

+1 pt if

(e) $\log(m-1) - \log(m+1) = -1$

$$\log\left(\frac{m-1}{m+1}\right) = -1$$

$$\frac{m-1}{m+1} = 10^{-1} = 0.1$$

$$m - 1 = 0.1(m+1)$$

$$m - 1 = 0.1m + 0.1$$

$$0.9m = 1.1$$

$$m = \frac{1.1}{0.9} \approx 1.22$$

+1 work

+2

(f) $e^{2t} + 5e^t - 6 = 0$

$$(e^t)^2 + 5(e^t) - 6 = 0$$

$$e^t = \frac{-5 \pm \sqrt{25 - 4(1)(-6)}}{2}$$

$$= \frac{-5 \pm 7}{2} = -6 \text{ or } 1.$$

+1 work

So get $e^t = -6$ or $e^t = 1$.

$e^t = -6$: no sol.

$e^t = 1$: $t = 0$

+2

2] $b = 0.75 = e^k$

2/2 $\ln(0.75) = \ln(e^k) = k$

$k = -0.288$ ← +2

3] $40 = 24 \cdot \left(1 + \frac{0.02}{12}\right)^{12t}$

4/4

$\frac{40}{24} = (1.00167)^{12t}$

$\ln(40/24) = \ln\left[(1.00167)^{12t}\right]$ } +1 work

$\ln(40/24) = 12t \cdot \ln(1.00167)$

$t = \frac{1}{12} \cdot \frac{\ln(40/24)}{\ln(1.00167)} \approx 25.5$ years

+3

4] (a) B = brain mass in kg

4/4 M = body mass. in kg

$$B = kM^{1/2}$$

~~B~~

$$4.783 = k \cdot (6000)^{1/2}$$

$$k = 0.062$$

$$B = 0.062 \cdot M^{1/2} \quad +2$$

(b) $B = 0.532 = 0.062\, M^{1/2}$

$$8.581 = M^{1/2}$$

$$M = 73.63 \text{ kg} \quad +2$$

5] +6/6

Find t:

$$3e^{0.02t} = 1.8\left(1+\frac{0.03}{12}\right)^{12t}$$

$$3e^{0.02t} = 1.8\left(1.0025\right)^{12t}$$

can't pull power down yet!!

$$\ln\left(3e^{0.02t}\right) = \ln\left(1.8\cdot(1.0025)^{12t}\right)$$

$$\ln(3)+\ln\left(e^{0.02t}\right) = \ln(1.8)+\ln\left((1.0025)^{12t}\right)$$

$$\ln(3)+0.02t = \ln(1.8)+12t\cdot\ln(1.0025)$$

$$\ln(3)-\ln(1.8) = 12\cdot\ln(1.0025)\,t - 0.02t$$

$$\ln(3/1.8) = \left[12\ln(1.0025)-0.02\right]\cdot t$$

$$t = \frac{\ln(3/1.8)}{12\ln(1.0025)-0.02}$$

$t \approx 51.27$ years

+6

* easy to make mistakes; if a good attempt is made, give +4/6.