Answers to Practice with Exponents and Logarithms

1) x^{10}

2) $a^n + a^\ell$ (cannot be simplified)

3) $a^{n+\ell+q}$

4) $(abc)^{-3} = 1/(abc)^3$

5) $17^{n+\ell+q}$

6) m^{13}

7) $m^{-9} = 1/m^9$

8) $u^{7/6}$

9) $2^6 = 64$

10) a^6

11) a^{-6}

12) 1

13) $a^n + a^\ell + a^q$
(cannot be simplified)

14) 1

15) undefined

16) 3

17) 2

18) 4

19) -7

20) 0

21) 72

22) $x^2 + \frac{y}{4}r^2$

23) $\ln(x^3) = 3\ln(x)$

24) 0

25) 100

26) $e^{120x-22}$

27) $\ln x - \ln y$

28) $27\ln x$

29) $\ln A + 84b\ln x - \ln y$

30) $\ln\left(A + x^{84b}\right) - \ln y$

31) $\ln A + qrs\ln x - s\ln y$

32) $\ln(A + rx^n)$
(cannot be simplified)

33) $-\ln(x^{21}) = -21\ln x$

34) $\frac{\log_e 100}{\log_e 10} = \frac{\log_e 10^2}{\log_e 10} = 2$

35) One proof is:

a) $e^{\ln u} = u, e^{\ln v} = v, e^{\ln(uv)} = uv$
(by definition of the logarithm)

b) $uv = e^{\ln u}e^{\ln v} = e^{\ln u + \ln v}$

c) $e^{\ln(uv)} = e^{\ln u + \ln v}$
(using a and b)

d) $\ln(uv) = \ln u + \ln v$

36) A variant on (35).

37) One proof is:

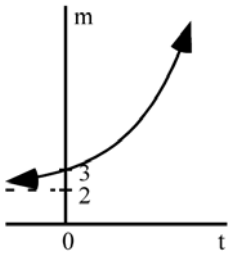
a) $e^{\ln u} = u$ so $e^{\ln y^{-2}} = y^{-2}$
(using def'n of logarithm)

b) $y^{-2} = \left(e^{\ln y}\right)^{-2} = e^{-2\ln y}$

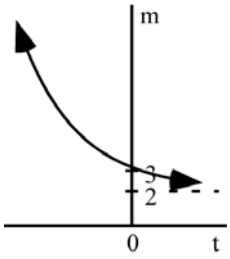
c) $e^{\ln y^{-2}} = e^{-2\ln y}$
(using a and b)

d) $\ln y^{-2} = -2\ln y$

38)



39)



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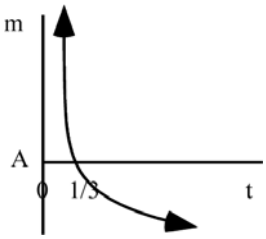

You should realize why $m = A$ when $t = 1/3$, and you should realize that there is no asymptote for m (it goes from $-\infty$ to ∞).

41) $\$21 = \$7e^{r(10)}$, so $r = \dfrac{\log 3}{10}$. The time t_d it takes for productivity to double can be determined by $\$14 = \$7e^{rt_d}$, so that $t = \dfrac{\log 2}{r} = 10\dfrac{\log 2}{\log 3}$.