

10: Logarithmic Functions --- Answers

1. For very large differences, as in (a), (c), (d), and (f), use magnitudes, for smaller differences, such as (b) and (e), use a linear scale.
2. The magnitude of a number a is the exponent b such that $10^b = a$.
3. 4; 6
4. 6.47
5. The magnitude function does not have constant rate of change.
6.
 - a) 2.08
 - b) 1.20
 - c) 3.69
7. $0 \leq y \leq 4$
8.
 - a) undefined
 - b) $0 < r < 1$
 - c) $\log r < 0$
 - d) $1 < r < 10$
9. Because ten raised to any power will always be positive.
10.
 - a) 0.477
 - b) 1.908
11.
 - a) 2.60206
 - b) 0.30103
 - c) 1.20412
 - d) 1.60206
12. 1.079
13. $10^{1.2} \approx 15.85$
14. It's easier to see changes in magnitude than changes in differences for large quantities.
15. 1.26
16. Given that the decibel level of 500 is approximately 27 (and 29 is 2 more than 27) we have $1.26^{29} \approx 814$. Since 814 is more than 750, when the sound level goes from 500 to 750 the decibel level increases by less than 2.
17. Both are based on exponents. For the exponential function the exponent is the input, for the logarithm function the exponent is the output.
18. Answers will vary. The magnitude of an earthquake and the brightness of a star are two things that a logarithm function will model.
19. The range is 6 orders of magnitude.
20. 100 times.