Exam # 1 Sample Review
Chapter 1 (except 1.4), 4.7, and focus on modeling

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1. (a) $k = 9.805806757$
   (b) 191.1504 feet

2. $f = \frac{3000}{x}$
   $g = 2x^2$
   $h = 0.25x$

3. degree 4

4. degree 3

5. The height of water in a harbor was given by the formula $h(t) = 4.9 + 4.4\cos\left(\frac{\pi t}{6}\right)$ where h is measured in feet and t is measured in hours since midnight.
   (a) 4.4
   (b) 12
   (c) 0.5 feet at 6 am.
   (d) $h(8) = 2.7$; At 8am the height of water was 2.7 feet.
   (e) average rate of change $= -0.825$ feet per hour
   From midnight to 8am, the hight of the water will drop on average by 0.825 feet each hour.

6. amplitude = 2
   period $= \frac{\pi}{2}$

7. (a) $y = 8 - 2.5\cos\left(\frac{\pi t}{2}\right)$
   (b) $y = 8 - 2.5\sin\left(\frac{\pi t}{2}\right)$
   (c) $y = 8 + 2.5\cos\left(\frac{\pi t}{2}\right)$

8. (a) best fitting is logistic: $y = \dfrac{61.17371}{1 + (1.40115x10^{20})e^{-0.24092x}}$ where x is the year.
   (b) 61.17371 million people
   (c) 1925
   (d) average rate of change = 0.242054 millions of people per year.
   From 1830 until 1910, the population increased on average by 0.242054 million people each year.

9. best fitting formula is quadratic.
   $y = 0.17485x^2 - 8.35119x + 145.42857$

10. (a) $g(f(x)) = 4x^2e^{x^2}$
    (b) $f(g(x)) = (4xe^x)^2 = 16x^2e^{2x}$

11. 1) shift right by 3 units
    2) stretch by a factor of 2
    3) shift up 6 units.

12. $x = \frac{\ln(A)-\ln(7)}{0.9}$

13. at 3.083 years and at 10.92907 years

14. (a) 13.064176%
    (b) 3.3002533 years

15. (a) 3.92207%
    (b) 28.011023 weeks

16. (a) $f(x) = 2.8(0.979213784)^x$ or $f(x) = 2.8e^{-0.0210052905x}$
    (b) $f(4) = 2.57435$ millirems/hour
    After 4 hours, the level of radiation was 2.57435 millirems/hour.
    (c) 76.6206 hours
    (d) 32.9987 hours

17. $y - 15 = 8(x - 7)$ or $y = 8x - 41$

18. $y = 0.25x - 2$

19. The monthly charge for a waste collection service is \$32 for 100kg of waste and \$48 for 180 kg of waste.
    (a) $c = 0.2w + 12$
    (b) The vertical intercept is 12.
    The minimum monthly charge, just to have the service, is \$12.