

Chapter 3 – Exponential Functions – Review

MCR3U

Jensen

Section 1: Exponential Growth and Decay

1) The population of a pod of Southern right whales has doubled in size recently over a 9 year period. They have a current population of 38 individuals. What might the population be after 25 more years?

2) A bacteria culture doubles every 15 minutes. There were 20 individuals initially.

a) How many bacteria will be present after 2 hours?

b) How long will it take to grow a population of 163 840?

3) A weight loss program aims for its clients to lost 5% of their weight each week. If Helene currently weighs 280 pounds, what can she expect to weigh at the end of the 12-week program?

4) The population of a developing city increases by 8% per year. In 2005, 125 000 people lived in the city.

a) What is the population expected in 2020?

b) In what year should the population reach half a million?

5) The half-life of Carbon-14 is approximately 6000 years. A fossil of Carbon-14 weighed 100 grams. How much would it weigh after 18 000 years?

6) A radioactive isotope decays rapidly with a half-life of 4 minutes. For a 12 minute test, technicians need at least 6 grams of the isotope to remain at the end of the test. How much must they start with?

7) A nuclear power plant has a stockpile of 100 tonnes of radioactive waste. The radioactive waste has a half-life of 15 years. How long will it take for there to be only 1 tonne remaining?

8) If Canada were to stop accepting immigrants the population would begin to decrease by 0.5% per year. Canada's population is currently 34, 482, 779. If it stopped accepting new immigrants today, what would the population be in 50 years?

9) The amount of sunlight a diver can see is halved for every 11 meters she dives. What percentage of light remains when the diver is 60 meters below the surface? (Hint: at the surface is 100% of the light)

10) Lead-210 decays very slowly with a half-life of 180 years. After 1000 years, how much of a 40 kg sample remains?

Section 2: Interest

11) A pension increases every year by 6%. If Opa has \$24 300 in his pension right now, how much will his pension be worth in 10 years?

12) An investor invests \$1000 into a mutual fund for 4 years at a growth rate of 2.5% per year. How much is the investment worth after 4 years?

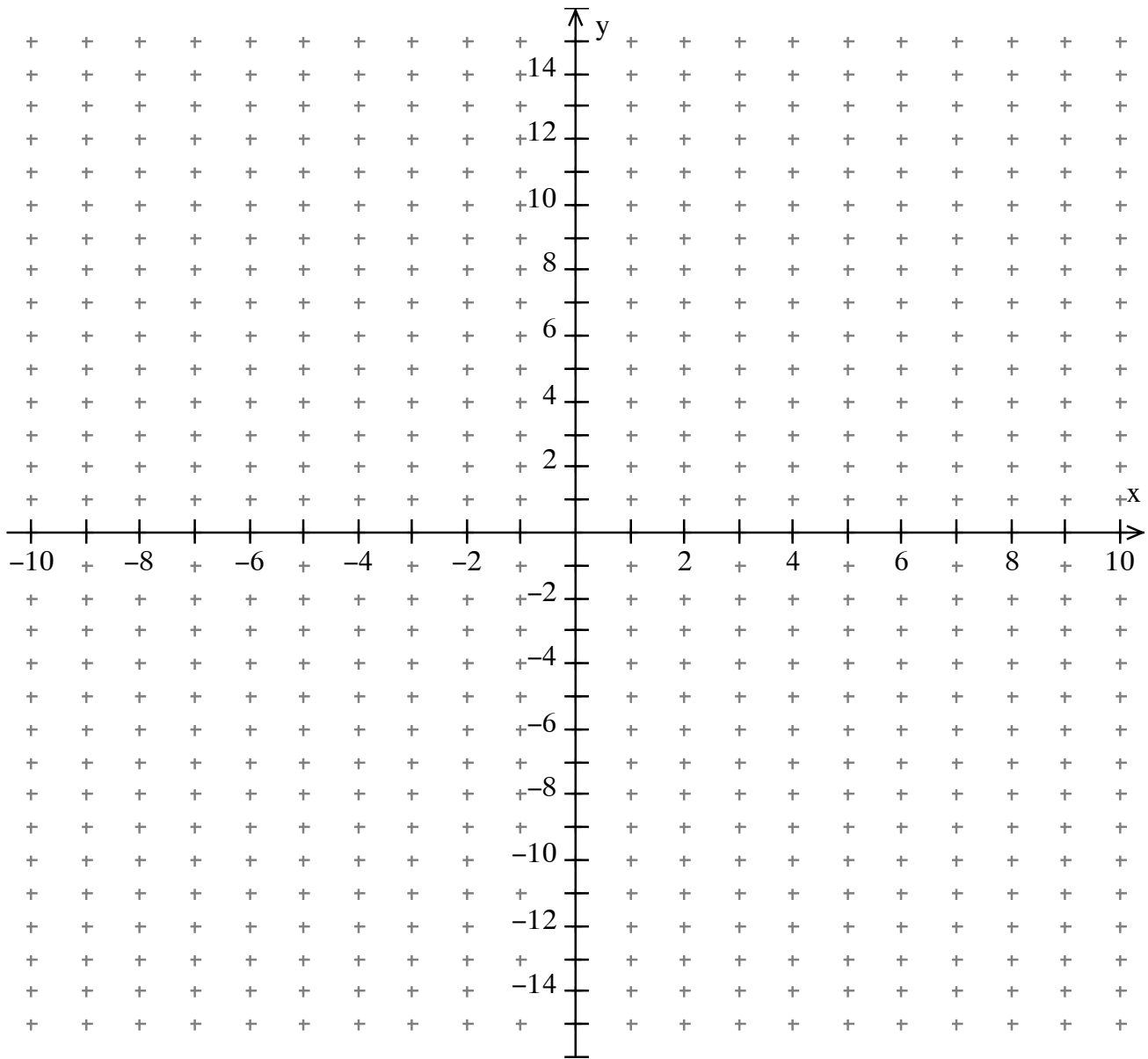
13) You have found an investment at the bank that pays 2.4% per year for 10 years. How much should you invest now so that you have \$2000 after the 10 years?

14) Jeremiah's grandparents placed \$3000 into an account for him when he was born. The investment is to be paid out when he turns 25. The account pays an annual interest rate of 8%, compounded semi-annually. How much will be in the account on Jeremiah's 25th birthday?

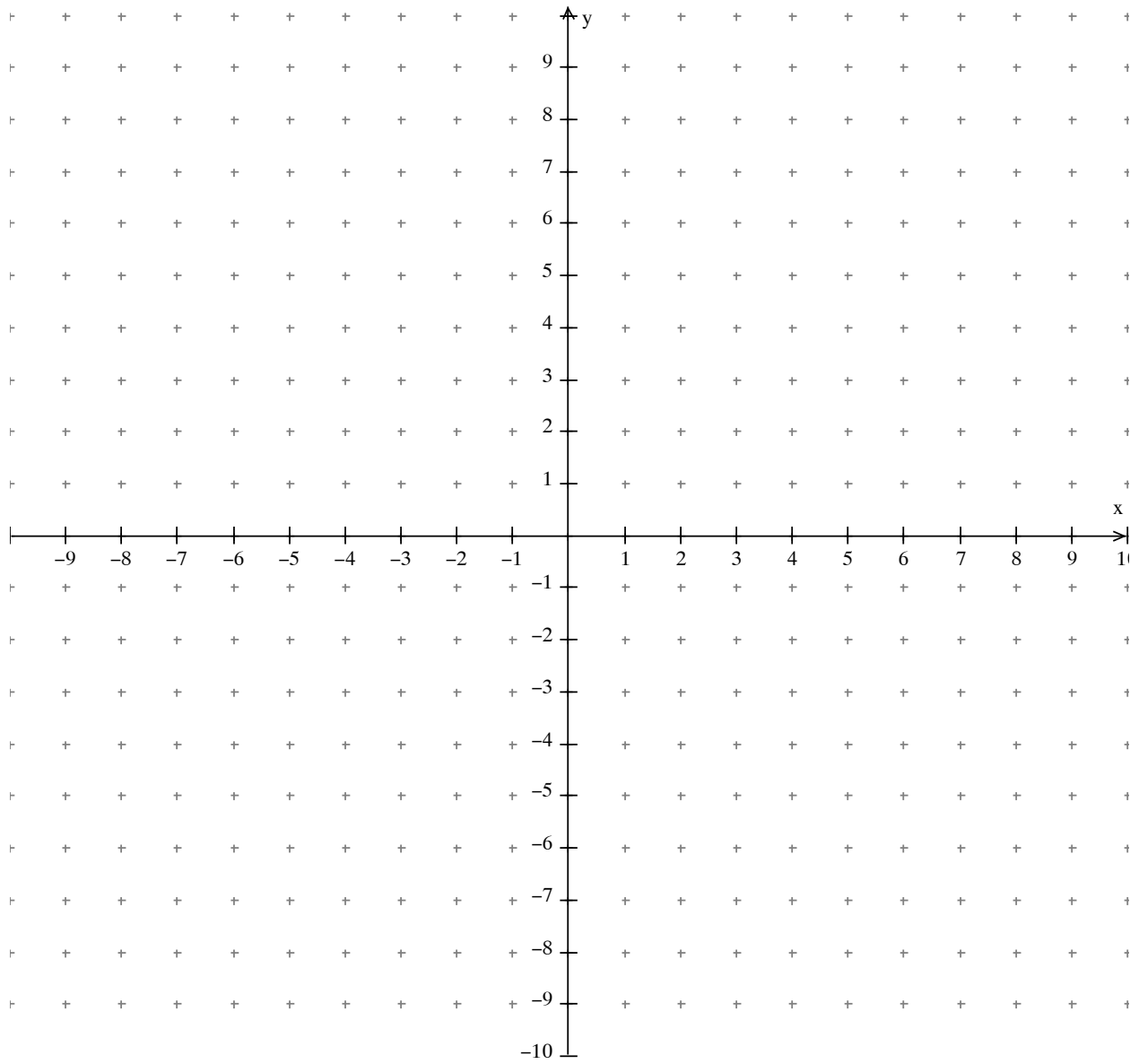
15) Graph of both of these functions on the graph below using transformations of the parent functions. State whether each function is increasing or decreasing:

a) $y = 2(2)^{-(x-2)} + 3$

b) $y = -3\left(\frac{1}{2}\right)^{x+1} - 5$



16) Graph the parent function $y = 1.5^x$ and the transformed function $y = -2(1.5)^{x+1} + 4$ onto the graph below:



17) Match the graphs that are the same:

a) $f(x) = 4^{2x}$

b) $g(x) = 25^x$

c) $p(x) = 2^{3x}$

d) $h(x) = 32^x$

e) $z(x) = 10^x$

i) $r(x) = 5^{2x}$ _____

ii) $u(x) = 8^x$ _____

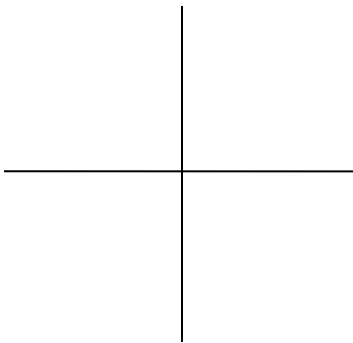
iii) $b(x) = 2^{5x}$ _____

iv) $a(x) = 16^x$ _____

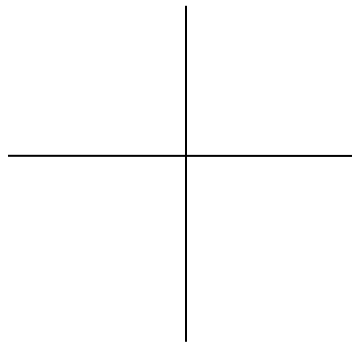
v) no match _____

18) Sketch the graph using your knowledge of increasing and decreasing exponential functions.

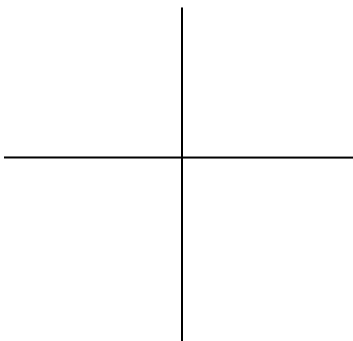
a) $f(x) = 5\left(\frac{1}{2}\right)^x$



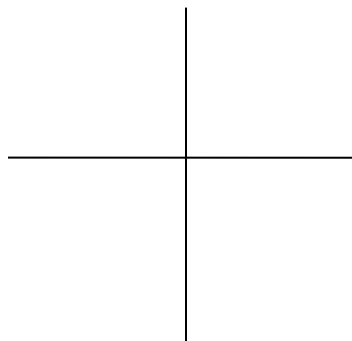
c) $g(x) = -3(4)^x$



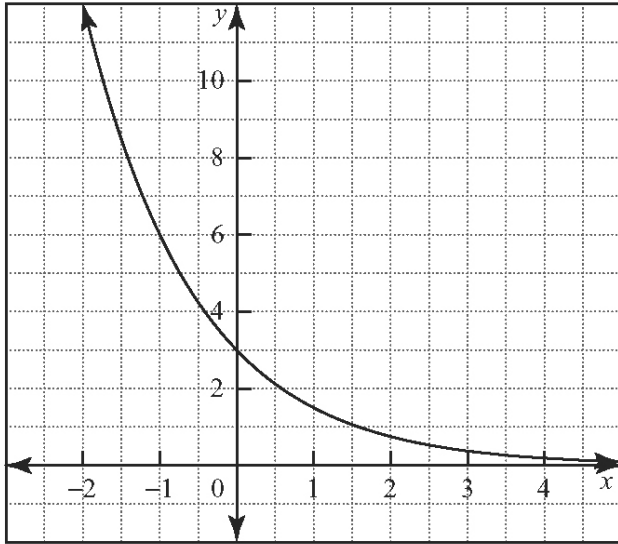
b) $h(x) = -5\left(\frac{1}{2}\right)^x$



d) $b(x) = 3(4)^x$



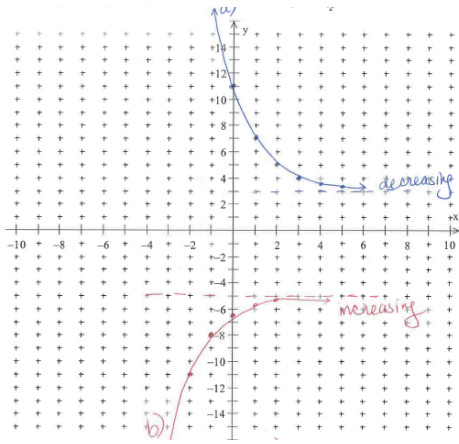
19) Write a function for the exponential graph shown



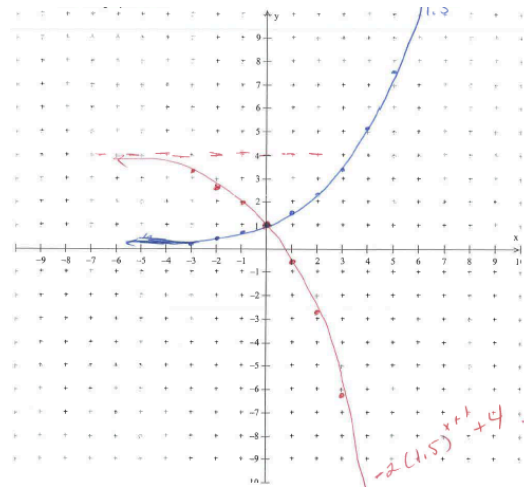
Answers

- 1) 260 whales
- 2) a) 5120 bacteria b) 195 minutes
- 3) 151.3 lbs
- 4) a) 396 521 b) 2023
- 5) 12.5 grams
- 6) 48 grams
- 7) Almost 100 years
- 8) 26 838 379
- 9) 2.28%
- 10) 0.85 kg
- 11) \$43 517.60
- 12) \$1103.81
- 13) \$1577.72
- 14) \$21 320.05

15)

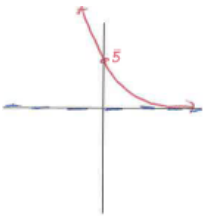


16)

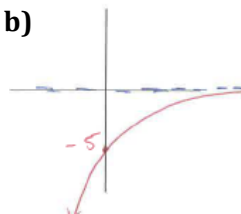


17) a) iv b) i c) ii d) iii e) v

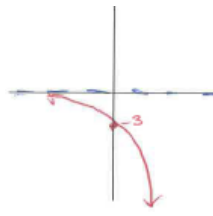
18) a)



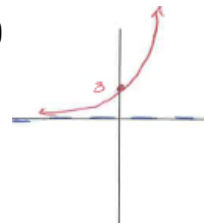
b)



c)



d)



19) $y = 3 \left(\frac{1}{2}\right)^x$