

1.3.3: Crossing Curves

Date: _____

Use **desmos** to answer the following questions.

Adjust the window settings as appropriate for each question.

1. Determine the point of intersection of each pair of functions graphically.

a) $y = 2^{x+4}$ and $y = 2^7$
Settings $(-6 \leq x \leq 6, -50 \leq y \leq 500)$

d) $f(x) = 6^{-x}$ and $f(x) = 8^{x+3}$
Settings $(-6 \leq x \leq 6, -5 \leq y \leq 50)$

b) $y = 9^6$ and $y = 27^x$
Settings $(-6 \leq x \leq 6, -50\,000 \leq y \leq 700\,000)$

e) $y = 3^{x+15}$ and $y = 27^{2x}$
Settings $(-6 \leq x \leq 6, -70\,000\,000 \leq y \leq 600\,000\,000)$

c) $f(x) = 6^{-x}$ and $y = 36^5$
Settings $(-12 \leq x \leq 6, -50\,000 \leq y \leq 70\,000\,000)$
OR $(-12 \leq x \leq 6, -5 \times 10^6 \leq y \leq 7 \times 10^7)$

f) $y = -x + 1$ and $y = 6^{-x}$
Settings $(-6 \leq x \leq 6, -0.5 \leq y \leq 1.5)$

2. a) Consider question 1(a) and the solution you determined.

How is the solution related to the expressions given for the exponents?

b) Suggest a rule for solving exponential equations without graphing.

c) Can you solve questions (b) through (e) in the same way? Why or why not?

3. Al has saved \$5000. He checked the website of a prominent bank. The rate for a savings account is 0.05% per annum, while the rate for a GIC is 3.85% per annum, both compounded annually. Al doesn't believe he wants to invest all \$5000 for 5 years. He compared saving \$5000 in the savings account to saving \$4500 in the GIC. How long will it take for the investments to be equal in value?

4. The SarJen marketing company has determined that the effect on customers of a particular advertising campaign is modelled according to the function $A = 100(1.7^{-0.08x})$, where x is the time in weeks since the end of the advertising campaign and A is the value on their advertising rating scale. Determine the number of weeks until the effect of the advertising will fall to half (or a rating of 50) [represent the 50 with $y = 50$ as function #1 using **desmos**].

5. For the following system of equations, find the point of intersection.

i) $y = 2x$ ii) $y = x^2$ iii) $y = 2^{-x}$

Check that the point of intersection found is actually a point on all three functions.

Describe the rate of increase for each of the three functions.

Answers

- 1a) (3, 128) b) (4, 531 441) c) (-10, 60 466 000) or (-10, 60 466 176) d) (-1.611, 17.946)
e) (3, 387 420 000) f) (0, 1) **AND** (0.729, 0.271)
2) [a,b,c,e: Yes], [d,f: Not Possible] 3) 2.826 years 4) 16.328 weeks 5) (2, 4)