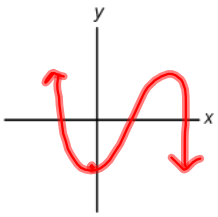
Value

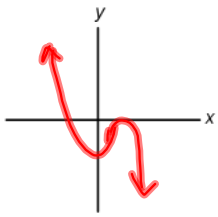
2 54.(b) Pat and Chris can paint the house in 5 hours if they work together. Pat is a professional painter and can paint twice as fast as Chris. How long would it take Pat to paint the house by himself?

2 55.(a) Sketch two possible graphs that are different, yet are both cubic functions with negative leading coefficients and negative y-intercepts. Explain why the graphs you have sketched are different.

Graph 1:



Graph 2:



Graph 1 has three x-intercepts.
Graph 2 has two.

Value

4 55.(b) Given the function $f(x) = 2x^3 + 5x^2 - 3x - 4$, complete the table to describe its characteristics.

(3) (i)

y-intercept	-4
end behaviour (left and right)	III → I
Max # of possible x-intercepts	3

x^3

(1) (ii) Explain why the graph of this function is not a parabola.

Degree is 3, a parabola is the graph of a quadratic with degree 2.

3 56.(a) Algebraically solve for x: $\sqrt{3} = 27^{4x+1}$

$3^{1/2} = (3^3)^{4x+1}$

$3^{1/2} = 3^{12x+3}$

$\frac{1}{2} = 12x + 3$

$\frac{1}{2} - 3 = 12x$

$\frac{1}{2} - \frac{6}{2} = 12x$

$-\frac{5}{2} = \frac{12x}{1}$

$24x = -5$

$x = -\frac{5}{24}$

Value

4 56.(b) Nora is about to invest $5000 in an account that pays 6% interest a year compounded monthly for the next 3 years. A different financial institution offers 6.5% interest a year compounded semi-annually for the next 3 years. Write a function that models the growth of Nora's investment for each situation. Should Nora invest her money in this financial institution instead? Explain why or why not.

Nora

$= 5000\left(1 + \frac{0.06}{12}\right)^{12(3)}$

$= 5000(1.005)^{36}$

$= 5983.40$

$= 5000\left(1 + \frac{0.065}{2}\right)^{2(3)}$

$= 5000(1.0325)^{6}$

$= 6057.74$

more interest

4 57.(a) Algebraically solve for x: $5^{x-1} - 8^{x+1} = 0$

$\log 5^{x-1} - \log 8^{x+1} = 0$

$x-1(\log 5) - x+1(\log 8) = 0$

$0.6990(x-1) - 0.9031(x+1) = 0$

$0.6990x - 0.6990 - 0.9031x - 0.9031 = 0$

$-0.204x - 1.6021 = 0$

$-0.204x = 1.6021$

$x \approx -7.9$

Value

3 57.(b) The pH scale is used to measure the acidity of a solution. The pH, $p(x)$, is defined by the equation $p(x) = -\log x$, where the concentration of hydrogen ions, x, in a solution is measured in moles per litre (mol/L).

(1) (i) Black coffee has a pH of 5. What is its hydrogen ion concentration?

$5 = -\log x$ $\quad 10^{-5} = x$

$-5 = \log x$

(2) (ii) Baking soda has a pH of 9. In terms of concentration, how much more acidic is black coffee than baking soda?

$9 = -\log x$

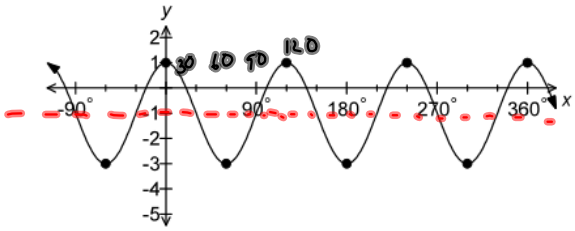
$-9 = \log x$

$10^{-9} = x$

$\frac{10^{-5}}{10^{-9}} = 10^{-5-(-9)}$

$10^{4} = 10000$ more times

6 58.(a) Use the sinusoidal function shown below to answer the questions that follow.



(4) (i) Determine the amplitude, period, equation of midline and the range.

amp $\Rightarrow 2$

midline $\rightarrow y = -1$

period $\rightarrow 120°$

R: $\{y \mid -3 \le y \le 1, y \in R\}$

(2) (ii) Use the information from part (i) to determine a function that represents the graph in the form $y = a\cos b(x) + d$.

120

$\frac{360}{3} \rightarrow b$

$y = 2\cos 3(x) - 1$

Value

3 59. Pat borrowed $2500 at a rate of 8% compounded monthly for 3 years. How much interest will Pat be charged for borrowing the money?

$2500\left(1+\frac{0.08}{12}\right)^{12(3)}$

$2500(1.0067)^{36}$

$= \$3179.38$

$3179.38 - 2500 = 679.38$ interest charged.