

PART 1 - CALCULATOR INACTIVE QUESTIONS

1. Below is a sketch of a polynomial. Determine:

(8 marks)

a. The multiplicities of each zero.

b. The degree of the polynomial.

(2)

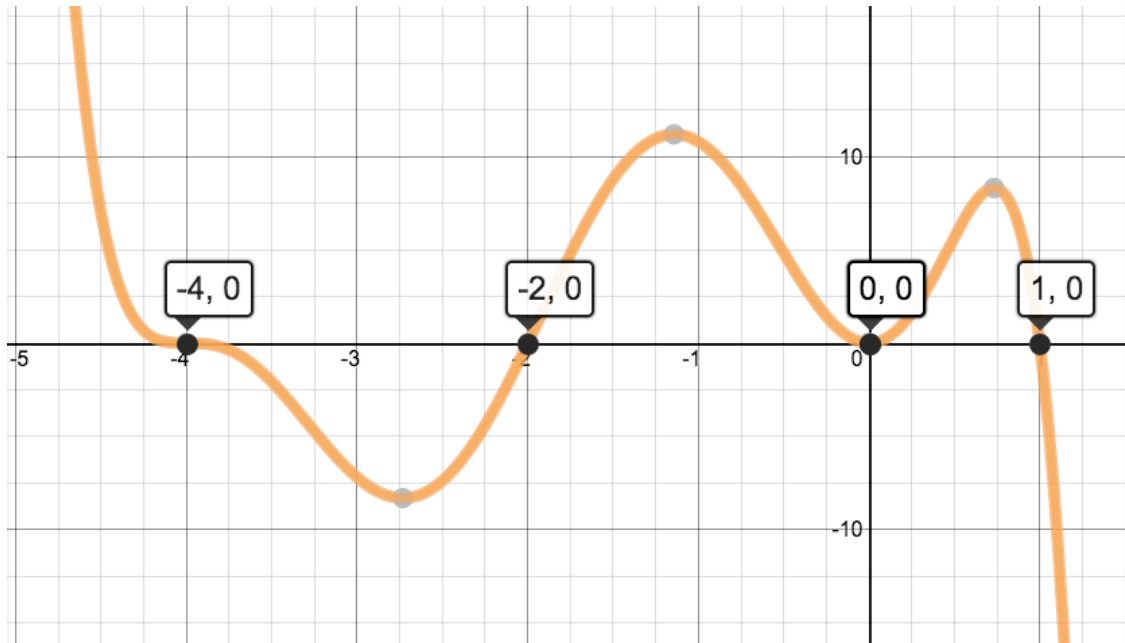
(1)

c. The sign of the leading coefficient.

d. Write a possible equation of this polynomial in factored form.

(1)

(4)



2. Isabel goes to school by one of two routes, A or B. The probability of going by route A is 30%. If she goes by route A, the probability of being late is 5% and if she goes by route B, the probability of being late is 10%

a. Draw a tree diagram

b. Find the probability that Isabel is late for school.

c. Given that she is late for school, find the probability that she went to school using route A

3. You were presented with two special right triangles, with which you can answer the following questions that deal with the special angles and their ratios.

(6 marks)

Draw the 30° - 60° - 90° right triangle here and label all sides and angles

Draw the 45° - 45° - 90° right triangle here and label all sides and angles

$$\sin^{-1}\left(\frac{\sqrt{3}}{2}\right) =$$

$$\tan(30^\circ) =$$

$$\cos(45^\circ) =$$

Solve the equation $2\sin(x) - 1 = 0$

If $f(x) = \cos(x)$, solve $f(x) = \frac{1}{2}$

If $f(x) = \tan(x)$, evaluate $f(60^\circ)$

4. Mr. Santowski and Mr. Smith each have started up separate textbook publishing companies. For Mr. Santowski's company, the monthly revenues since January 1, 2015 are modeled by the equation

$R(t) = 12000 + 24000e^{-0.07t}$ and for Mr. Smith's company, the monthly revenues since January 1, 2015 are

modeled by the equation $R(t) = 11000(1.0225)^t$.

(10 marks)

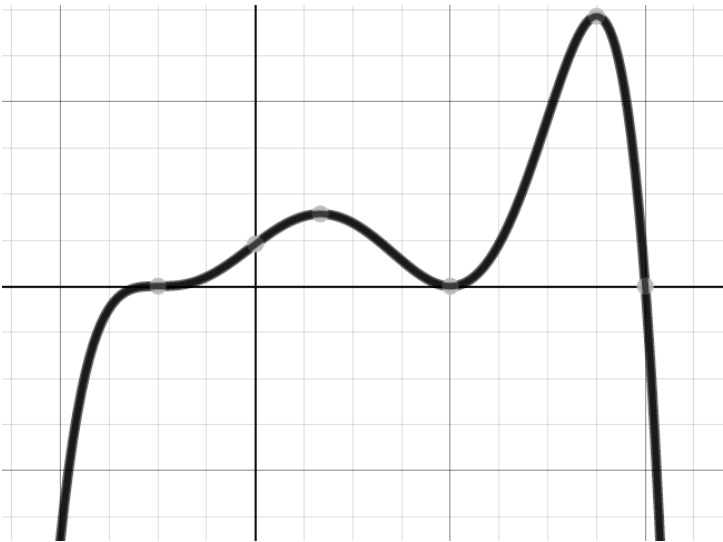
- At what rate are the revenues of both company changing?
- Which company has growing revenues? How do you know?
- Evaluate $R(0)$ for both companies.
- What does $R(20)$ represent?
- State a reasonable domain and range for this problem. Explain your reasoning.

5. If the function $f(x) = 5\sin(3x) - 4$ starts at $x = 0$ and complete 4 cycles, determine the period & amplitude & equation of the axis of the curve and the domain and range.

(5 marks)

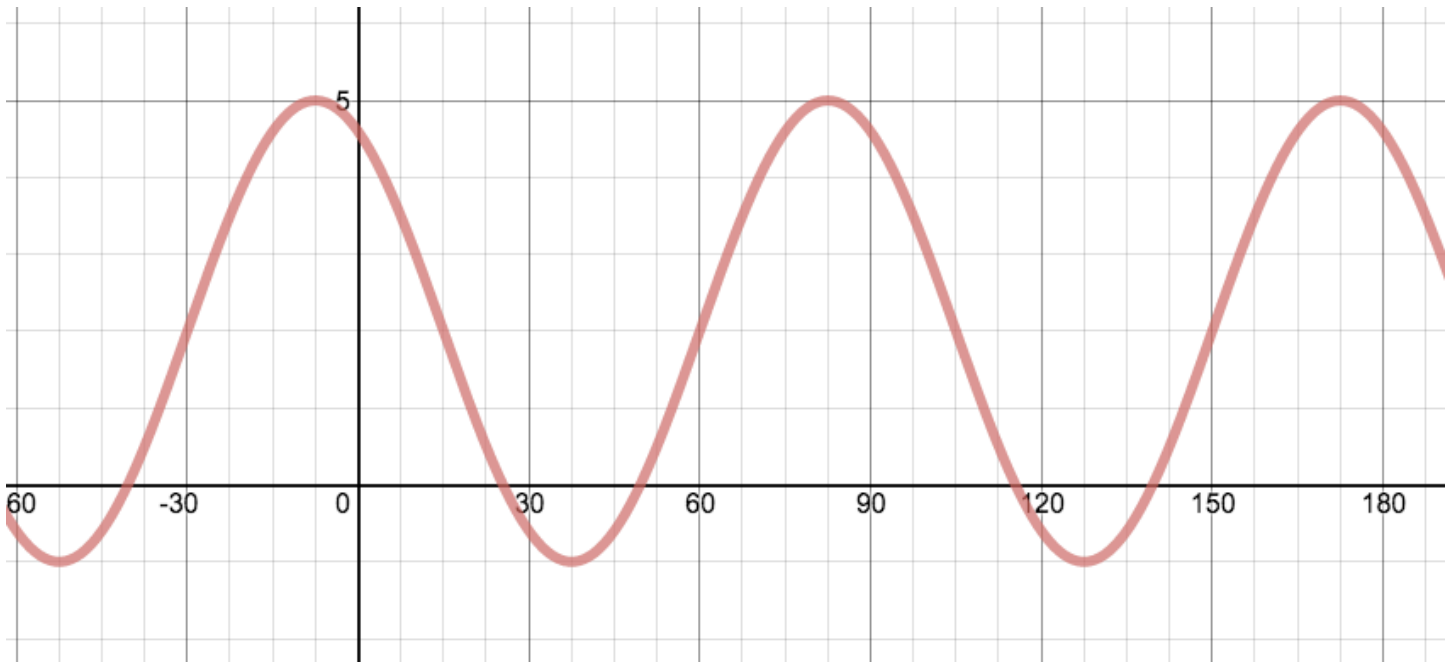
6. Give three plausible reasons why the graph below cannot possibly be the graph of $p(x) = x^4 + x^2 - 2$.

(3 marks)



7. Here is a graph of a transformed sine function. Use this graph to state the amplitude, period, axis of the curve and then write the equation of this sinusoidal function (use sin OR cosine as you wish).

(5 marks)



8. The rational function, $R(x)$, has a vertical asymptote at $x = -1/2$ and a horizontal asymptote at $y = -4$. Write a possible equation for $R(x)$.

(3 marks)

9. A bag contains three white marbles, five green marbles, and two red marbles. What is the probability of randomly picking at least 2 green marbles in three tries? Assume that the first marble picked is not put back into the bag.

10. Here is an equation of a polynomial: $f(x) = \frac{1}{2}(x - 4)^2(x - 2)^3(x + 1)(1 - x)$.

(8 marks)

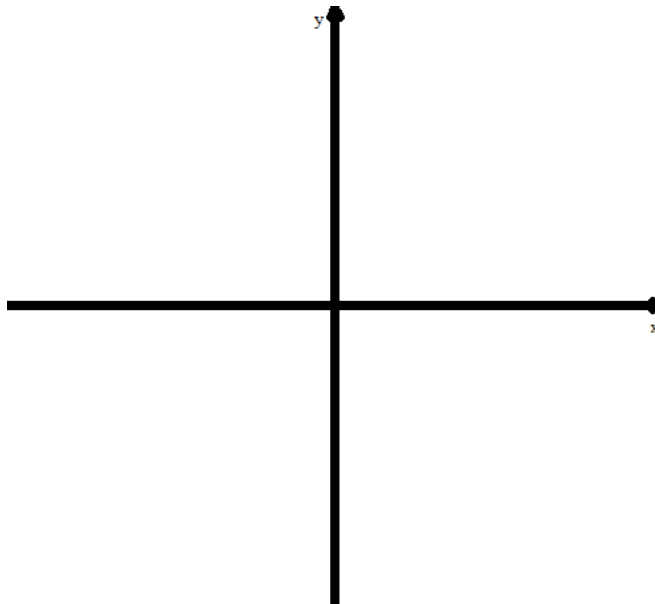
a. Determine the leading coefficient. (2)

b. State the degree of the polynomial. (1)

c. Determine the value of the y-intercept. (2)

d. Sketch $f(x)$

(3)



11. Of the 28 students in a class, 12 have a part time job, 22 have a part time job or do regular volunteer work, and 4 of the students have a part time job and do regular volunteer work.

a. Display the data in a Venn diagram.

b. How many of the students do not have a part time job or do not volunteer regularly?

c. How probable is it that a student does volunteer work given that they have a part time job?

12. You are given the following sequence of numbers: $\left\{72, -36, 18, -9, \frac{9}{2}, \dots\right\}$. The following questions deal with an analysis of this sequence of numbers.

(5 marks)

- a. Describe the pattern. (HINT: is there a mathematical relationship that exists amongst the terms?)
- b. List the next three terms of the sequence.

c. DESCRIBE how you would determine the 16th term of this sequence. (BONUS: what IS the 16th term?)

13. Given the polynomial $Q(x) = x^3 + 11x^2 - x^4 - 9x - 18$, answer the following questions. Show/explain the thinking or working that leads to your answers.

(5 marks)

- a. Is $x - 1$ a factor of this polynomial?
- b. Is 3 a zero of this polynomial?

(2)

(2)

c. What is the end behaviour of this polynomial?

(1)

14. Given the rational function $f(x) = \frac{-3x + 6}{2x - 3}$, determine:

(6 marks)

a. the equations of the vertical and horizontal asymptotes.

b. the domain and range of $f(x)$

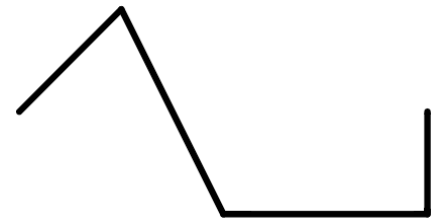
(2)

(2)

c. the x- and y-intercepts of $f(x)$

(2)

15. Draw 2 cycles of a graph of the given periodic function (see diagram) whose period is 30, the amplitude is 10 and whose axis of the curve is $y = 20$. Make sure that your sketch is properly scaled along the x- and y-axis. The cyclical pattern (i.e. the parent function) is shown at the right →



(4 marks)



16. Solve the following equations. Show key steps in your solutions if relevant (part marks may thus be awarded)

(15 marks)

(a) $4^x = \frac{1}{16}$

(b) $\log_8 32 = x$

(c) $27^{-\frac{2}{3}} = x$

(d) $\log_6(2x - 4) = 2$

(e) $x^3 = \frac{1}{27}$

(f) $\log_x\left(\frac{1}{32}\right) = -5$

(g) $81^{0.5} - \log_4(64) + \ln(1) = x$

17. Knowing that $x = -4$ is an x-intercept of the cubic function $p(x) = 2x^3 + 11x^2 + 10x - 8$, fully factor the polynomial. Once factored, state the values of the zeroes of $p(x)$.

(7 marks)

18. A group of 70 students were asked if they played hockey (H), basketball (B) or soccer (S). The diagram below displays the results.

How probable is it that a randomly chosen student plays:

- i. hockey & basketball?
- ii. hockey or basketball?
- iii. hockey & soccer?
- iv. neither of the three sports?
- v. only 1 sport?
- vi. Basketball **given that** they play soccer?
- vii. Soccer **given that** they play hockey?

