

PART A - CALCULATOR ACTIVE (21 marks)

1. Determine the equation that fits the following data well. Justify why you think this equation is appropriate.

x	-3.2	-2.9	-2.4	-0.9	0	1.1	1.7	1.9	2
y	-9	-2	4.5	-1	-9	-11	-2	3	6

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2. Evaluate $\lim_{x \rightarrow \infty} f(x)$, where

a) $f(x) = 3x^6 - x^7$

b) $f(x) = \frac{3 - 4x}{5x + 1}$

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3. For the function $g(x) = \frac{3x^5 - 4x^3 + 1}{x^3 - 3x^2 - 4}$, state

a) the values of the intercepts and clearly indicate which is which

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b) the equation(s) of the vertical asymptotes

c) the equation of the end behaviour asymptote

d) the domain of $g(x)$

4. Write the equation in EXPANDED FORM of a possible 5th degree polynomial $f(x)$ with the following roots (let the leading coefficient equal 1). Use only the given roots; do not "invent" roots that are not implied by the given information.

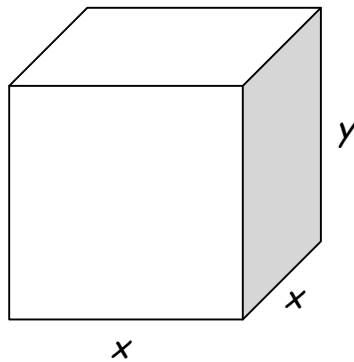
Root: i

Root: 2

$$f(x) =$$

/1

5. The United States Parcel Service has contracted you to design a box that has a volume of 100 cubic inches and the dimensions as per the diagram.



- a) Write an equation that relates x and y for the box, and isolate y . (The only unknowns are x and y .)

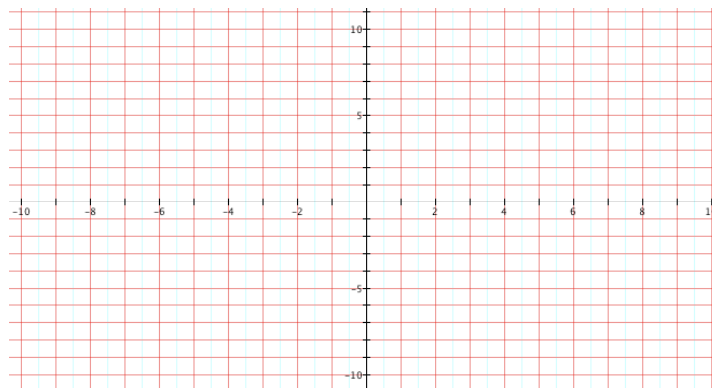
- b) Write the formula for surface area of the box in terms of x only, $S(x)$.

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- c) What amount of cardboard, measured in square inches, minimizes the surface area and for what value of x does this minimum occur?

6. WRITE the equation in factored form of a rational function that has the following characteristics: crosses the x - axis at 3, touches the x - axis at -1, has a vertical asymptote at $x = -2$, has a second vertical asymptote at $x = 4$ and has one horizontal asymptote at $y = -2$. CONFIRM BY GRAPHING your answer in a standard zoom window and COPY THE GRAPH here. Sketch all asymptotes as dotted lines.

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PART B - NO CALCULATOR (41 marks)

$\frac{2}{/}$ 7. True or false and explain: $(x-1)$ is a factor of $f(x) = -x^{49} + x^{48} + x^{18} - x^{17} - x^{15} + x^{14} + 2x^9 - 3x^8 - 2x^7 + 3x^6 - 2x^2 + 7x - 4$.

$\frac{1}{/}$ 8. List all of the possible rational roots of $f(x) = 3x^9 - 4x^6 + x^5 - 2x^2 + 5$.

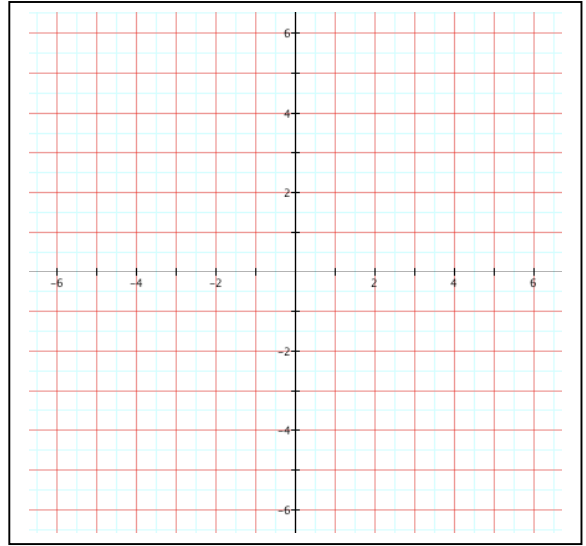
9. A boy blows up an initially empty (circular) balloon for 10s until its radius reaches 5 cm. True or false and explain: at some time between 0 seconds and 10 seconds, the balloon has a radius of 3.8 cm.

$\frac{3}{/}$ 10. Use the fact that $(x-3)$ is a factor of $f(x) = 6x^3 - 13x^2 - 21x + 18$ to factor $f(x)$ as a product of linear factors.

$\frac{3}{/}$

11. Sketch the graph of $f(x) = -(x+1)^3(x-1)^2(x+4)(2x-1)^2$ on the grid below, and
- a) state the end behaviour monomial of $f(x)$

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- b) solve $-(x+1)^3(x-1)^2(x+4)(2x-1)^2 \geq 0$

12. Solve $\frac{(x-1)^2(x+2)}{(x-3)^2(x+4)^3} \geq 0$.

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13. Determine all of the possible values of the real number A such that the function

$$k(x) = \frac{Ax^3 + 2x - A}{(x+1)^2(x-2)}$$

has a hole in its graph.

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14. Rewrite the following functions in transformational form (feel free to replace the function name with y). Then, complete the table below and sketch accurately.

a) $f(x) = 2x^2 - 4x - 6$

b) $g(x) = \frac{x^2 - 2x - 8}{x^2 - 16}$

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Basic Function Eq'n		Basic Function Eq'n	
Transformations		Transformations	
x - intercepts		x - intercepts	
y - intercept		y - intercept	
Coord. of vertex		Coord. of hole	
Domain:		Domain:	
Range:		Range:	
Int. of Continuity:		Int. of Continuity:	

