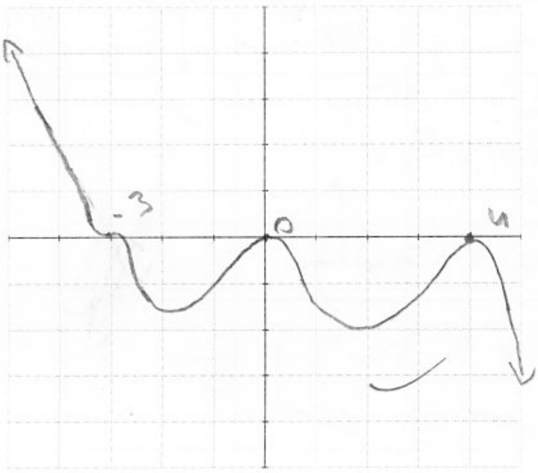
DATE: October

KNOWLEDGE/UNDERSTANDING

1. Given $f(x) = -2x^2(x+3)^3(x-4)^2$.

odd

[4]



* b/ Solve $f(x) > 0$ and state your answer in interval notation.

[3]

$x \in (-\infty, -3)$, $f(x) > 0$

	$(-\infty,-3)$	$(-3,0)$	$(0,4)$	$(4,\infty)$
$-2x^2$	−	−	−	−
$(x+3)^3$	−	+	+	+
$(x-4)^2$	+	+	+	+
	+	−	−	−

2. Solve the following equation, where $x \in R$.

factors 0, 3

$$x^4 - 3x^3 + 7x^2 - 21x = 0$$

[5]

$x(x^3 - 3x^2 + 7x - 21) = 0$

$3(3^3 - 3(3)^2 + 7(3) - 21) = 0$

$27 - 27 + 21 - 21 = 0$

$0 = 0$

$$\begin{array}{r|rrrr} 3 & 1 & -3 & 7 & -21 \\ & & 3 & 0 & 21 \\ \hline & 1 & 0 & 7 & 0 \end{array}$$

$x(x^2+7)(x-3) = 0$

$x^2 + 7 = 0$

$x^2 = -7$

$x(x^2+7)(x-3) = 0$

$\therefore$ The solution is x can be 3 or 0, $x^2 = -7$ is not a solution because $\sqrt[2]{-7}$ is not an element of the Real numbers

3. Solve the following inequalities.

a/ $-3(x-4) + 7 \geq 2x - 21$

[3, 2]

$-3x + 12 + 7 \geq 2x - 21$

$-3x + 19 \geq 2x - 21$

$40 \geq 5x$

$x \leq 8$

b/ $-8 < 6x - 10 < 16$

$2 < 6x < 26$

$2/6 < x < \frac{26}{6}$

$1/3 < x < 13/3$

[6]

	$(-\infty,-4]$	$(-4,1/2)$	$(1/2,3)$	$(3,\infty)$	
Test values	-5	0	1	4	
$(x-3)^2$	+	+	+	+	
$(2x-1)$	−	−	+	+	
$(3x^2+7)$	+	+	+	+	
$(x+4)$	−	+	+	+	
-5	−	−	−	−	
output	−	+	−	−	
	✓	✗	✓	✓	

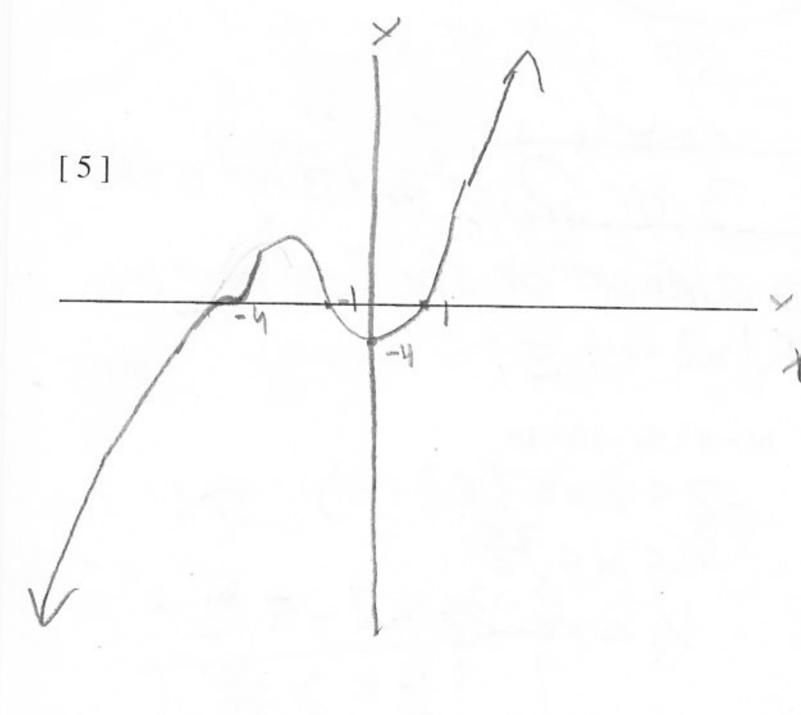
State your answer in: Set notation: $-\infty < x \le -4$ or $1/2 \le x \le \infty$

Interval Notation: $x \in (-\infty,-4] \cup [1/2,\infty)$

4. Create a graph of a QUINTIC function that has three x-intercepts, two turning points and a positive leading coefficient. Write a possible equation for your hypothetical graph.

$f(x)=a(x+4)^3(x-1)(x+1)$

[5]



$a(0+4)^3(0-1)(0+1)=-4$

$-64a=-4$

$a=16$

$f(x)=16(x+4)^3(x-1)(x+1)$

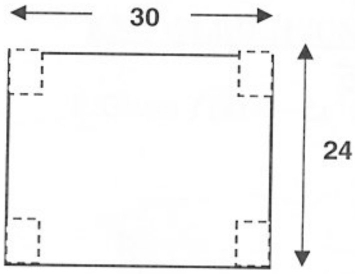
NOTES:

1. Make sure to account for all possibilities!

2. The DIMENSIONS of the BOX are: LENGTH, WIDTH & HEIGHT.

3. Use at least 2 decimal places precision for all calculations & answers that are not integers.

let x be the sides of the square



[12]

$(30-2x)(24-2x)x \le 1040$ ✓

260, 2, 130, 2, 115

$x(720-60x-48x+4x^2) \le 1040$

$4x^3-108x^2+720x \le 1040$

$4x^3-108x^2+720x-1040 \le 0$ ✓

$4(x^3-27x^2+180x-260) \le 0$ ✓

$(x-2)$ ✓

$$\begin{array}{r|rrrr} 2 & 1 & -27 & 180 & -260 \\ & & 2 & -50 & 260 \\ \hline & 1 & -25 & 130 & 0 \end{array}$$ ✓

$x^2-25x+130$

∴ The squares can have dimensions of greater than 0 and less or equal to two or greater than or equal to 7.38cm but less than 12cm

$\frac{25 \pm \sqrt{25^2-4(130)}}{2} = \frac{25 \pm \sqrt{105}}{2}$

$\frac{25+\sqrt{105}}{2} = 17.62$ ✓

$\frac{25-\sqrt{105}}{2} = 7.38$ ✓ possible values

$x \in (0,2] \cup [7.38,12)$

$24-2x > 0$

$24 > 2x$, $x < 12$

	L	W	H
✓	26	20	2
X	-5.24	-11.24	17.62
✓	15.24	9.24	7.38

COMMUNICATION

6. What is the difference between the solution to a linear equation and a linear inequality?

[2] A solution for a linear equation has one finite value while an inequality represents a range of values

7. Does the inequality $x^4 + 1 < 0$ have a solution? Briefly explain.

[2] $x^4 < -1$ This inequality has no solution, when rearranged it results in $x^4 < -1$, anything to an even exponent can never be less than 0 since no matter what all number multiplied by itself an even amount of times is positive.

8. State an inequality that would have solution $x \in R$.

[1] $|x| \ge 0$ Absolute values are always positive or 0 so $|x| \ge 0$ is always true for $x \in R$

9. Factor $f(x) = -2x^4 + 10x^3 - 2x^2 - 42x + 36$. Use the factored form of the function along with its y-intercept to sketch a possible graph of f(x).

[10]

$-2(x^4 - 5x^3 + x^2 + 21x - 18) = 0$

$3 \,|\, 1 \;\; -5 \;\; 1 \;\; 21 \;\; -18$
$\quad\;\; 3 \;\; -6 \;\; -15 \;\; 18$
$\quad 1 \;\; -2 \;\; -5 \;\; 6 \;\; 0$

$1 \,|\, 1 \;\; -2 \;\; -5 \;\; 6$
$\quad\;\; 1 \;\; -1 \;\; -6$
$\quad 1 \;\; -1 \;\; -6 \;\; 0$

$x^2 - x - 6 = 0$

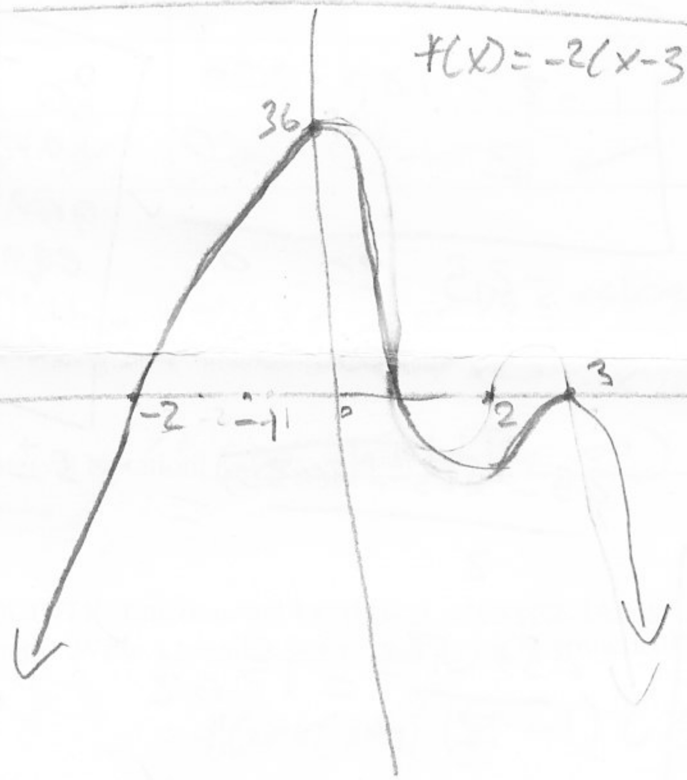
$(x+2)(x-3)$

$-2(x-3)(x^3 - 2x^2 - 5x + 6) = 0$

$f(x) = -2(x-3)^2(x-1)(x+2)\cancel{(x+3)}$

zeroes: $-2, 1, 3$

$f(x) = -2(x-3)^2(x-1)(x+2)$



10. Solve: $\mathbf{4 \le 7 - 3|4 - 5x| < 13}$

[6]

$-3 \le -3|4-5x| < 6$

$1 \ge |4-5x| \cancel{> -2}$ ← means nothing |anything| is always greater then or equal to 0

$1 \ge (4-5x) \ge -1$

$-3 \ge -5x \ge -5$

$\boxed{\tfrac{3}{5} \le x \le 1}$

$1 \ge 1 \ge -4+5x \ge -2$

$5 \ge 5x \ge 2$

$\cancel{1 \ge x > 2/5}$

$-3 \ge -5x \ge -6$

$\frac{3}{5} \le x \le \frac{6}{5}$

$3/5 \le x \le 1$