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Problem 11: (4pts) Solve the inequalities below and express your answer in interval notation as well as with a number line picture.

(a.) $5 - 3x \leq 8x - 7$,

(b.) $\frac{2}{3} - \frac{1}{2}x \geq \frac{1}{6} + x$,

(c.) $|8x + 3| > 12$,

(d.) $|7x - 14| + 3 \leq 10$.

Problem 12: (7pts) Solve the following inequalities using an appropriate technique. Show your work and write the answer using interval notation (you might need to use \cup for union)

(a.) $x^2 + 5x + 6 \geq 0$,

(b.) $\frac{1}{x^2 + 5x + 6} < 0$,

$$(c.) \frac{x^2(x+3)}{x^2-13x+12} \geq 0,$$

$$(d.) \frac{x^2+3x}{2x^2+8x+10} \geq 0,$$

$$(e.) x^3 < 4x^2 - 3x,$$

$$(f.) \frac{3}{x-1} - \frac{4}{x} \geq 1,$$

(g.) $x^4 - 10x^2 + 9 > 0$.

Problem 13: (2pts) Plot the following regions:

(a.) $\{(x, y) \mid |x| \leq 2\}$,

(b.) $\{(x, y) \mid |x - 1| \leq 1 \text{ and } |2y + 8| \leq 4\}$,

Problem 14: (1pt) Given $P_1 = (2, 3)$ and $P_2 = (8, -7)$ find the distance between P_1 and P_2 and find the location of the midpoint between the given pair of points.

Problem 15: (1pt) Given $A = (1, 2)$, $B = (5, 2)$, $C = (3, 6)$ and $D = (7, 6)$ form the vertices of a parallelogram \mathcal{P} . Find the area of \mathcal{P} . Show your work including appropriate diagrams.

Problem 16: (1pt) Find the area of the triangle with vertices $P = (-2, 1)$, $Q = (4, 1)$ and $R = (7, 4)$. Show your work including appropriate diagrams.

Problem 17: (1pt) Consider the equation $y(x^2 + 1) = 1$. If $P = (1, 1)$, $Q = (1, 1/2)$ and $R = (-1, 1/2)$ then which of the points P, Q, R are on the graph of the given equation ?

Problem 18: (2pt) Use a graphing calculator or appropriate website to plot the following equations. Sketch the result by hand as your answer. Include explicit labels of any x or y -intercepts.

(a.) $x^4 + y^4 + 20xy = 1$, (CLICK HERE FOR ANSWER)

(b.) $\frac{x + y}{x^4 + y^3} = 1$ (CLICK HERE FOR ANSWER)

Problem 19: (1pts) The graph of $x^2 - axy + y^2 = 1$ varies according the choice of a . Try the linked website graph to explore what happens as we vary a be adjusting the slider in Desmos. Describe the possible graphs in words. (CLICK HERE FOR THE GRAPH)

Problem 20: (3pts) The standard form of a circle equation is $(x - h)^2 + (y - k)^2 = R^2$. In the standard form just given we have a circle with radius R and center (h, k) . Use completing the square and algebra as needed to place each circle equation below into standard form. Find the center and radius in each case. (CLICK HERE TO CHECK ANSWER)

(a.) $x^2 + y^2 + 6y + 2 = 0$,

(b.) $x^2 + y^2 + \frac{1}{2}x + 2y + \frac{1}{16} = 0$,

(c.) $3x^2 + 3y^2 + 6x - y = 0$.

Problem 21: (5pts) Find the equation of a line given that:

(a.) the line contains points $(-1, -3)$ and $(0, 1)$,

(b.) the line with x -intercept 4 and y -intercept of -2 ,

(c.) the line perpendicular to $x + 3y = 2$ with y -intercept 4,

(d.) the line through $(-1, 2)$ which is parallel to the y -axis,

(e.) the line through $(-4, 7)$ which is parallel to the line $y = 3x + 8$.

Problem 22: (2pts) Use a graphing calculator or appropriate website to solve the following equations graphically. Give answers rounded to two decimals.

(a.) $16x^3 + 16x^2 = x + 1$ for $-2 \leq x \leq 2$,

(b.) $1 + \sqrt{x} = \sqrt{1 + x^2}$ for $-1 \leq x \leq 5$.

You could use THIS GRAPH to help solve part (a.). Or, another approach for part (b.) is to convert the problem to solving

$$1 + \sqrt{x} - \sqrt{1 + x^2} = 0$$

for $-1 \leq x \leq 5$. Hence look for x -intercepts in THIS GRAPH.