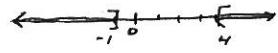


MATH 111 EXAM 1, Fall 2015

Show all work!		Name: <u>Key</u>	Score																
1.	<p>Given the points $P(-2, 3)$ and $Q(4, -1)$, find:</p> <p>a) The distance $d(P, Q)$.</p> $\begin{aligned} d(PQ) &= \sqrt{(4+2)^2 + (-1-3)^2} \\ &= \sqrt{6^2 + 4^2} \\ &= \sqrt{52} \\ &= 2\sqrt{13} \end{aligned}$ <p>Ans: _____</p>	<p>b) The slope of the segment \overline{PQ}.</p> $m = \frac{-1-3}{4+2} = -\frac{4}{6} = -\frac{2}{3}$ <p>Ans: _____</p>	<table border="1"> <tr><td>1</td><td></td></tr> <tr><td>2</td><td></td></tr> <tr><td>3</td><td></td></tr> <tr><td>4</td><td></td></tr> <tr><td>5</td><td></td></tr> <tr><td>6</td><td></td></tr> <tr><td>7</td><td></td></tr> <tr><td>8</td><td></td></tr> </table>	1		2		3		4		5		6		7		8	
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2.	<p>a) Solve for x: $4(x-1) = 2x+1$.</p> $\begin{aligned} 4x - 4 &= 2x + 1 \\ 2x &= 5 \\ x &= 5/2 \end{aligned}$ <p>Ans: _____</p>	<p>b) Solve for x: $(3/x) + (4/x) = (1/x)$.</p> $\begin{aligned} \frac{7}{x} &= \frac{1}{x} \\ 7 \neq 1 &\quad \text{no sol} \end{aligned}$ <p>Ans: _____</p>	<table border="1"> <tr><td>9</td><td></td></tr> <tr><td>10</td><td></td></tr> <tr><td>Tot</td><td></td></tr> </table>	9		10		Tot											
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3.	<p>Solve the Equations:</p> <p>a) $3x^2 - 8x - 3 = 0$</p> $\begin{aligned} \frac{1}{3}(3x-9)(3x+1) &= 0 \\ (x-3)(3x+1) &= 0 \\ x = 3 \quad \text{or} \quad 3x+1 &= 0 \\ 3x &= -1 \\ x &= -1/3 \end{aligned}$ <p>Ans: $x = 3, -1/3$</p>	<p>b) $x^2 = x + 1$</p> $\begin{aligned} x^2 - x - 1 &= 0 \\ x = \frac{1 \pm \sqrt{1+4}}{2} &= \frac{1 \pm \sqrt{5}}{2} \quad (\text{Golden ratio}) \end{aligned}$ <p>Ans: _____</p>																	
4.	<p>Find the equations of the lines passing through:</p> <p>a) The points $(1, -3)$ and $(2, -4)$.</p> $\begin{aligned} m &= \frac{-4+3}{2-1} = -1 \\ \frac{y+3}{x-1} &= -1 \\ y+3 &= -x+1 \\ y &= -x-2 \end{aligned}$ <p>Ans: _____</p>	<p>b) The point $(1, 2)$ and \perp to the line $4x + 2y = 9$.</p> $\begin{aligned} m_{\perp} &= -\frac{1}{2} = \frac{1}{2} \\ 2y &= 9 - 4x \\ y &= -2x + 9/2 \end{aligned}$ $\begin{aligned} \frac{y-2}{x-1} &= \frac{1}{2} \\ y-2 &= \frac{1}{2}x - \frac{1}{2} \\ y &= \frac{1}{2}x + \frac{3}{2} \end{aligned}$ <p>Ans: $y = \frac{1}{2}x + \frac{3}{2}$</p>																	
5.	<p>a) Solve: $\frac{3}{x-2} = \frac{1}{x-1} + \frac{7}{(x-1)(x-2)}$.</p> $\begin{aligned} 3(x-1) &= (x-2) + 7 \\ 3x-3 &= x+5 \\ 2x &= 8 \\ x &= 4 \end{aligned}$ <p>Ans: _____</p>	<p>b) Solve: $2x^4 - 17x^2 - 9 = 0$</p> $\begin{aligned} (x^2-9)(2x^2+1) &= 0 \\ x^2 &= 9 \quad 2x^2 = -1 \\ x &= \pm 3 \quad x^2 = -\frac{1}{2} \\ x &= \pm \frac{1}{\sqrt{2}} i \end{aligned}$ <p>Ans: $x = \pm 3, \pm \frac{1}{\sqrt{2}} i$</p>																	
	Extra Space																		

6.	<p>Solve: $\sqrt{15+2x} - x = 6$</p> $\begin{aligned}\sqrt{15+2x} &= 6 + x \\ 15+2x &= 36+12x+x^2 \\ 0 &= x^2+10x+21 \\ (x+3)(x+7) &= 0 \\ x &= -3, -7\end{aligned}$	<p><i>Check</i></p> $\begin{aligned}x &= -3 \quad \sqrt{15-6} + 3 = 6 \quad \checkmark \\ x &= -7 \quad \sqrt{15-14} + 7 \neq 6 \quad \times\end{aligned}$ <p>Ans: <u>$x = -3$</u>.</p>								
7.	<p>How many cc. of pure HCl should be added to 20 cc. of a 30% HCl solution to get a 50% solution?</p> <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <th>Amt</th> <th>%</th> </tr> <tr> <td>x</td> <td>100%</td> </tr> <tr> <td>20</td> <td>30%</td> </tr> <tr> <td>$x+20$</td> <td>50%</td> </tr> </table> $\begin{aligned}\frac{100}{100}x + \frac{30}{100} \cdot 20 &= \frac{50}{100}(x+20) \\ \frac{100}{100}x + \frac{30}{100} \cdot 20 &= \frac{50}{100}(x+20)\end{aligned}$	Amt	%	x	100%	20	30%	$x+20$	50%	$\begin{aligned}100x + 600 &= 50x + 1000 \\ 50x &= 400 \\ x &= 8\end{aligned}$ <p>Ans: _____.</p>
Amt	%									
x	100%									
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$x+20$	50%									
8.	<p>Solve the following inequalities:</p> <p>a) $2 < 2x - 4 < 10$.</p> $\begin{aligned}6 &< 2x & 14 \\ 3 &< x & 7\end{aligned}$ <p><i>Sol:</i> $\{x \in \mathbb{R} \mid 3 < x < 7\}$</p> <p><u>Ans: $(3, 7)$</u></p>	<p>b) $3 - 2x \geq 5$.</p> $\begin{aligned}3 - 2x &\geq 5 & -2x &\leq -5 \\ -2x &\geq 2 & -2x &\leq -8 \\ x &\leq -1 & x &\geq 4\end{aligned}$  <p><u>Ans: $(-\infty, -1] \cup [4, \infty)$</u></p>								
9.	<p>Write in the form $a + bi$</p> <p>a) $(4+3i)(4-3i) = 4^2 - 3^2 i^2$ $= 16 - 9(-1)$ $= 25$</p>	<p>b) $\frac{4+i}{4-i} = \frac{4+i}{4-i} \left(\frac{4+i}{4+i} \right) = \frac{16+8i+i^2}{4^2-i^2}$ $= \frac{15+8i}{17} = \frac{15}{17} + \frac{8}{17}i$</p> <p>Ans: _____.</p>								
10.	<p>Solve the following system of equations:</p> $\begin{cases} 2x+y = 2 \\ 3x+2y = 1 \end{cases}$ $\begin{aligned}2x+y &= 2 & y &= 2 - 2x \\ 3x+2y &= 1 \\ \hline -4x-2y &= -4 \\ -x &= -3 \\ x &= 3 \\ \therefore y &= -4\end{aligned}$	<p>Ans: _____.</p>								
	<p>Extra Space</p>									