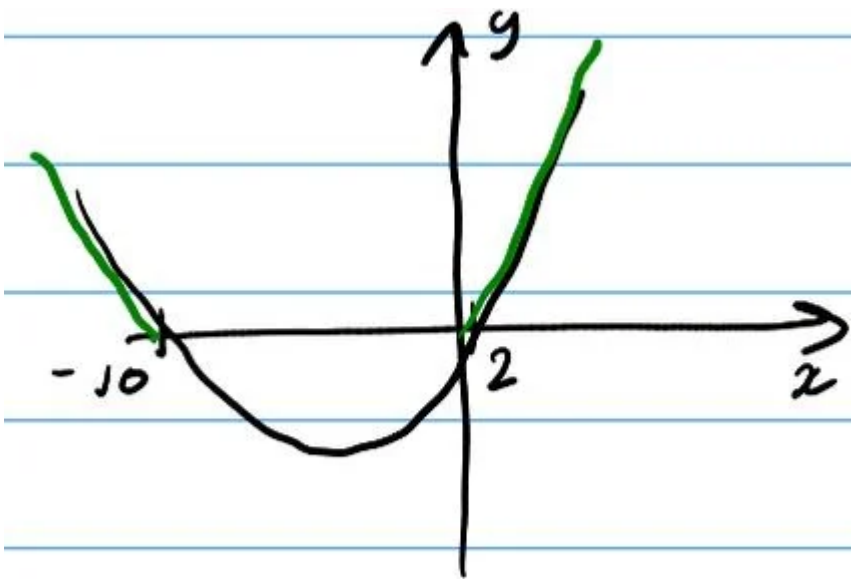
1 (a) $x^2 + 8x - 20 > 0$ $(x + 10)(x - 2) > 0$ Critical values: $x = -10, x = 2$



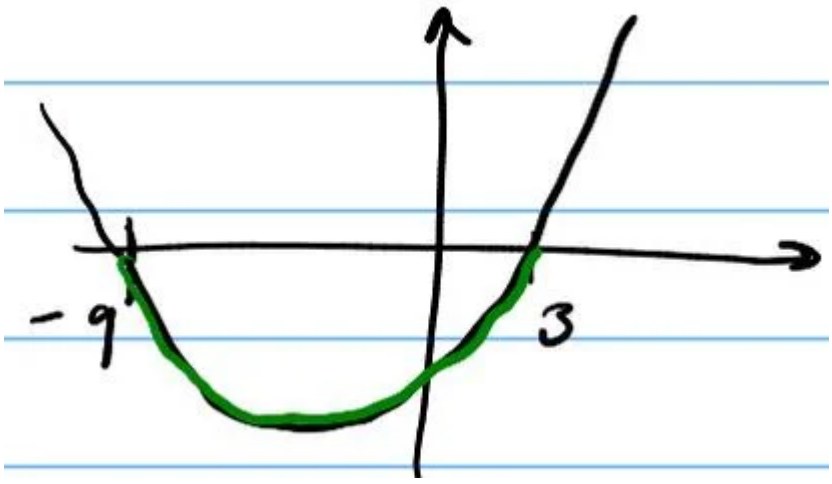
$x < -10$ or $x > 2$ (3)

(b) $18 + 3x < 23 + x$ $2x < 5$ $x < 2.5$ Combining with part (a): $x < -10$ or $2 < x < 2.5$ (1)

(Total for question 1 is 4 marks)

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2 $x^2 + 6x + 5 < 32$ $x^2 + 6x - 27 < 0$ $(x + 9)(x - 3) < 0$ Critical values: $x = -9, x = 3$



$-9 < x < 3$ (4)

(Total for question 2 is 4 marks)

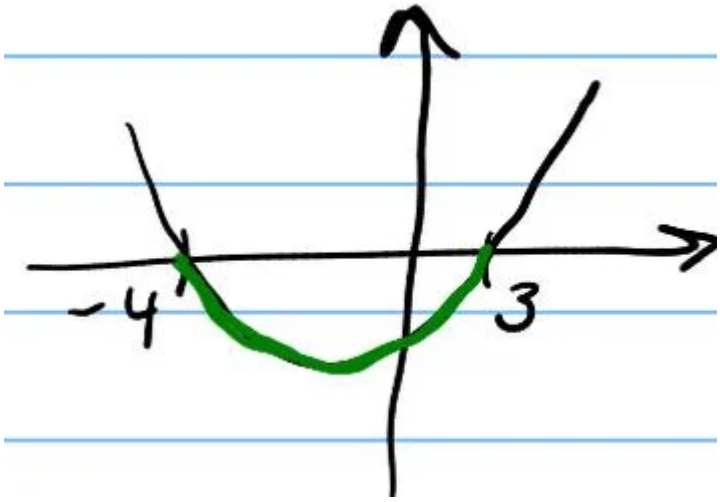
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3 $y = 3 - x$ $x^2 + 2(3-x)^2 - 8x = 6$ $x^2 + 2(9 - 6x + x^2) - 8x = 6$ $x^2 + 18 - 12x + 2x^2 - 8x = 6$ $3x^2 - 20x + 12 = 0$ $(x-6)(3x-2) = 0$ $x = 6, x = \frac{2}{3}$ When $x = 6, y = -3$ When $x = \frac{2}{3}, y = \frac{7}{3}$ $x = 6, y = -3$ or $x = \frac{2}{3}, y = \frac{7}{3}$ (4)

(Total for question 3 is 4 marks)

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4 $x^2 + x - 12 \leq 0$ $(x+4)(x-3) \leq 0$ Critical values: $x = -4, x = 3$



$-4 \leq x \leq 3$ (3)

(Total for question 4 is 3 marks)

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5 $x^2 + (3x-1)^2 - 2x = 19$ $x^2 + 9x^2 - 6x + 1 - 2x = 19$ $10x^2 - 8x - 18 = 0$ $5x^2 - 4x - 9 = 0$ $(5x - 9)(x+1) = 0$ $x = 1.8, x = -1$ When $x = 1.8, y = 3(1.8) - 1 = 4.4$ When $x = -1, y = 3(-1) - 1 = -4$ Coordinates: $(1.8, 4.4)$ and $(-1, -4)$ (4)

(Total for question 5 is 4 marks)

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6 $y = 7 - x$ $7 - x = x^2 - 2x + 7$ $x^2 - x = 0$ $x(x-1) = 0$ $x = 0, x = 1$ When $x = 0, y = 7$ When $x = 1, y = 6$ Coordinates: $(0, 7)$ and $(1, 6)$ (4)

(Total for question 6 is 4 marks)

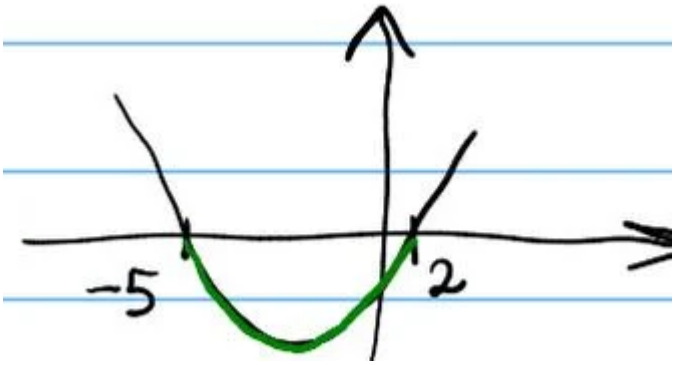
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7 $x = 3 - 2y$ $(3-2y)^2 + y^2 - 2y(3-2y) = 6$ $9 - 12y + 4y^2 + y^2 - 6y + 4y^2 = 6$ $9y^2 - 18y + 3 = 0$ $3y^2 - 6y + 1 = 0$ $y = \frac{6 \pm \sqrt{36-12}}{6} = \frac{6 \pm \sqrt{24}}{6} = \frac{6 \pm 2\sqrt{6}}{6} = \frac{3 \pm \sqrt{6}}{3}$ When $y = \frac{3+\sqrt{6}}{3}, x = 3 - 2(\frac{3+\sqrt{6}}{3}) = \frac{9-6-2\sqrt{6}}{3} = \frac{3-2\sqrt{6}}{3}$ When $y = \frac{3-\sqrt{6}}{3}, x = 3 - 2(\frac{3-\sqrt{6}}{3}) = \frac{9-6+2\sqrt{6}}{3} = \frac{3+2\sqrt{6}}{3}$ (7)

(Total for question 7 is 7 marks)

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8 (a) $(x+5)(x-2) < 0$ Critical values: $x = -5, x = 2$



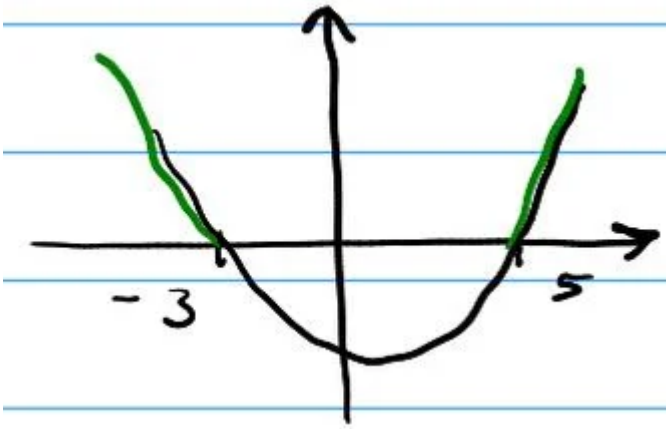
$-5 < x < 2$ (3)

(b) $9 + 3x \leq 12 + x$ $2x \leq 3$ $x \leq 1.5$ Combining with part (a): $-5 < x \leq 1.5$ (2)

(Total for question 8 is 5 marks)

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9 $x^2 - 2x - 15 > 0$ $(x-5)(x+3) > 0$ Critical values: $x = 5, x = -3$

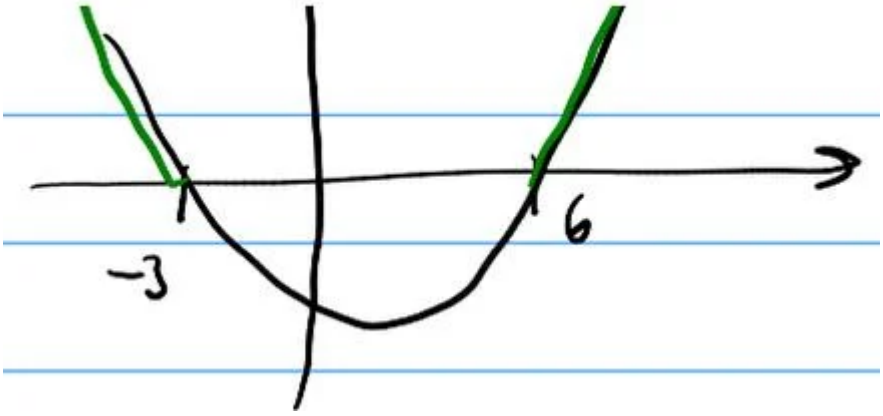


$\{x : x < -3\} \cup \{x : x > 5\}$ (3)

(Total for question 9 is 3 marks)

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10 $x^2 - 3x - 18 > 0$ $(x-6)(x+3) > 0$ Critical values: $x = 6, x = -3$

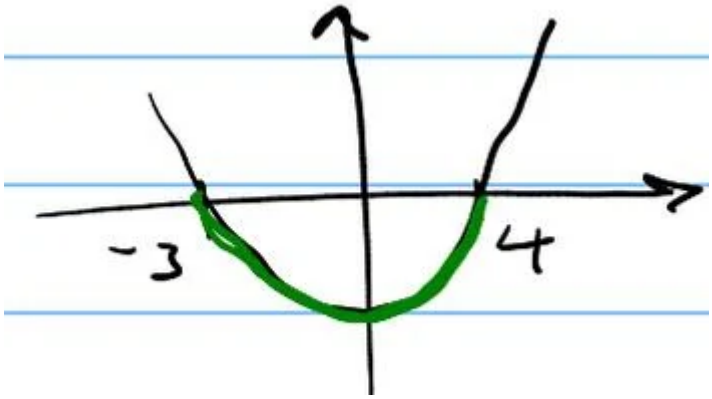


$x < -3$ or $x > 6$ (2)

(Total for question 10 is 2 marks)

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11 $(x-4)(x+3) < 0$ Critical values: $x = 4, x = -3$



$\{x : -3 < x < 4\}$ (3)

(Total for question 11 is 3 marks)

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12 $3y = 2 - x \implies y = \frac{2-x}{3}$ $2x(\frac{2-x}{3}) + x^2 - 32 = 0$ $\frac{4x-2x^2}{3} + x^2 - 32 = 0$ $4x - 2x^2 + 3x^2 - 96 = 0$ $x^2 + 4x - 96 = 0$ $(x+12)(x-8) = 0$ $x = -12, x = 8$ When $x = -12, y = \frac{2-(-12)}{3} = \frac{14}{3}$ When $x = 8, y = \frac{2-8}{3} = -2$ Points: $(-12, \frac{14}{3})$ and $(8, -2)$ (5)

(Total for question 12 is 5 marks)

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13 $18 + 2 < 5x + x$ $20 < 6x$ $x > \frac{20}{6}$ $x > \frac{10}{3}$ (2)

(Total for question 13 is 2 marks)

14

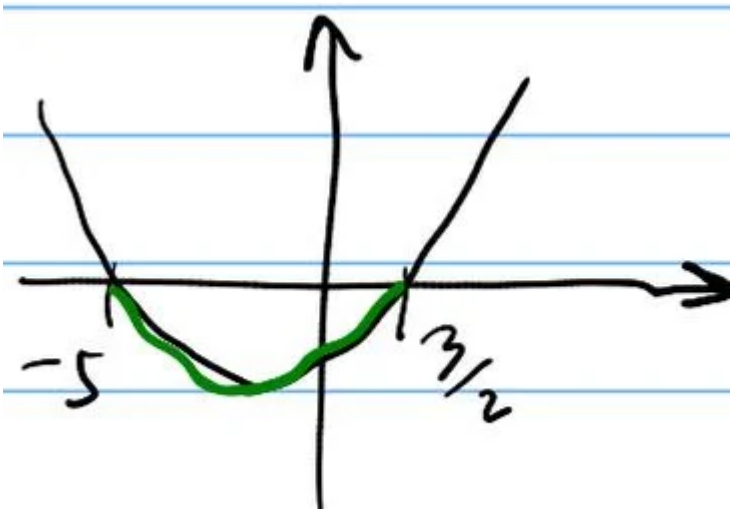
(a) $px^2 - 4px - 5p = 2x - 12$ $px^2 + (-4p - 2)x + (12 - 5p) = 0$ For no intersection, $b^2 - 4ac < 0$ $(-4p - 2)^2 - 4(p)(12 - 5p) < 0$ $16p^2 + 16p + 4 - 48p + 20p^2 < 0$ $36p^2 - 32p + 4 < 0$ $9p^2 - 8p + 1 < 0$ (4)

(b) Solve $9p^2 - 8p + 1 = 0$ $p = \frac{8 \pm \sqrt{64-36}}{18} = \frac{8 \pm \sqrt{28}}{18} = \frac{8 \pm 2\sqrt{7}}{18} = \frac{4 \pm \sqrt{7}}{9}$ $\frac{4-\sqrt{7}}{9} < p < \frac{4+\sqrt{7}}{9}$ (4)

(Total for question 14 is 8 marks)

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15 $2x^2 + 7x - 15 < 0$ $(2x - 3)(x + 5) < 0$ Critical values: $x = 1.5, x = -5$



$\{x : -5 < x < 1.5\}$ (3)

(Total for question 15 is 3 marks)
