

Question 1:

(a)[3 points] Expand and simplify:

$$\begin{aligned} & (t-5)^2 - 2(t+3)(8t-1) \\ &= t^2 - 10t + 25 - 2[8t^2 + 23t - 3] \\ &= t^2 - 10t + 25 - 16t^2 - 46t + 6 \\ &= -15t^2 - 56t + 31 \end{aligned}$$

(b)[3 points] Write as a single simplified fraction:

$$\begin{aligned} & \frac{2}{a^2} - \frac{3}{ab} + \frac{4}{b^2} \\ &= \frac{2b^2 - 3ab + 4a^2}{a^2b^2} \end{aligned}$$

(c)[4 points] Simplify:

$$\begin{aligned} & \frac{\frac{x}{x+1} + \frac{x}{1+x}}{1} \\ &= \frac{x}{x+x^2+x} \\ &= \frac{\cancel{x}(1+x)}{\cancel{x} + x^2 + \cancel{x}} \\ &= \frac{1+x}{2+x} \end{aligned}$$

Question 2:

(a)[3 points] Factor:

$$\begin{aligned} & x^2 - 2x - 8 \\ & = (x-4)(x+2) \end{aligned}$$

(b)[4 points] Factor

$$\begin{aligned} & 8x^2 + 10x + 3 \\ & = 8x^2 + 4x + 6x + 3 \\ & = 4x(2x+1) + 3(2x+1) \\ & = (2x+1)(4x+3) \end{aligned} \quad \left\{ \begin{array}{l} (8)(3) = 24 \\ (6)(4) = 24, \\ 6+4 = 10 \end{array} \right.$$

(c)[3 points] Factor

$$\begin{aligned} & 4t^2 - 9s^2 \\ & = (2t)^2 - (3s)^2 \\ & = (2t-3s)(2t+3s) \end{aligned}$$

Question 3:

(a)[4 points] Simplify

$$\begin{aligned} & \frac{x^3 + 5x^2 + 6x}{x^2 - x - 12} \\ &= \frac{x(x^2 + 5x + 6)}{(x-4)(x+3)} \\ &= \frac{x(x+2)\cancel{(x+3)}}{(x-4)\cancel{(x+3)}} \\ &= \frac{x(x+2)}{x-4} \end{aligned}$$

(b)[3 points] Complete the square:

$$\begin{aligned} & x^2 - 16x + 80 \\ &= (x-8)^2 - 64 + 80 \\ &= (x-8)^2 + 16 \end{aligned}$$

(c)[3 points] Simplify:

$$\begin{aligned} & \left( \frac{y^5 z^{-15}}{x^3} \right)^{3/5} \\ &= \frac{(y^5)^{3/5} (z^{-15})^{3/5}}{(x^3)^{3/5}} \\ &= \frac{y^3 z^{-9}}{x^{9/5}} \\ &= \frac{y^3}{x^{9/5} z^9} \end{aligned}$$

Question 4:

(a)[3 points] Solve for  $x$ :

$$\underbrace{2x^2}_{a} + \underbrace{7x}_{b} + \underbrace{2}_{c} = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-7 \pm \sqrt{7^2 - 4(2)(2)}}{2(2)}$$

$$= \frac{-7 \pm \sqrt{33}}{4}$$

$$\therefore x = \frac{-7 + \sqrt{33}}{4}, \frac{-7 - \sqrt{33}}{4}$$

(b)[4 points] Rationalize the numerator:

$$\frac{\sqrt{2+h} + \sqrt{2-h}}{h} \cdot \frac{\sqrt{2+h} - \sqrt{2-h}}{\sqrt{2+h} - \sqrt{2-h}}$$

$$= \frac{2+h - (2-h)}{h(\sqrt{2+h} - \sqrt{2-h})}$$

$$= \frac{2h}{h(\sqrt{2+h} - \sqrt{2-h})}$$

$$= \frac{2}{\sqrt{2+h} - \sqrt{2-h}}$$

(c)[3 points] Simplify:

$$\sqrt[4]{r^{4n+1}} \sqrt[4]{r^{-1}}$$

$$= (r^{4n+1})^{\frac{1}{4}} (r^{-1})^{\frac{1}{4}}$$

$$= (r^{4n+1-1})^{\frac{1}{4}}$$

$$= (r^{4n})^{\frac{1}{4}}$$

$$= r^n$$

Question 5:

(a)[5 points] Solve the inequality and state your solution using interval notation:

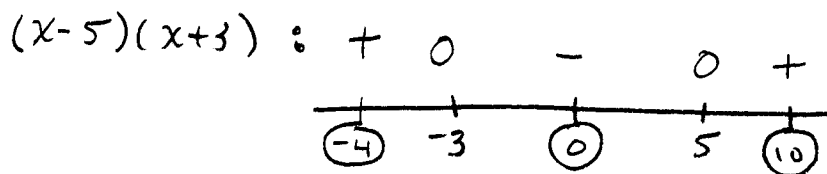
$$x^2 < 2x + 15$$

$$x^2 - 2x - 15 < 0$$

$$x^2 - 2x - 15 = 0$$

$$(x-5)(x+3) = 0$$

$$x=5, x=-3$$



$$\therefore x^2 - 2x - 15 < 0 \text{ on } (-3, 5)$$

(b)[5 points] Solve and state your solution using interval notation:

$$|5x + 2| < 6$$

$$-6 < 5x + 2 < 6$$

$$-8 < 5x < 4$$

$$-\frac{8}{5} < x < \frac{4}{5}$$

$$\therefore \left(-\frac{8}{5}, \frac{4}{5}\right)$$