

## Algebra and Calculus: Homework 6 Solutions

### Section 1.3: 58,126

- *Q58*: Simplify  $(\sqrt{h^2 + 1} + 1)(\sqrt{h^2 + 1} - 1)$ .

Use FOIL:

$$\begin{aligned}(\sqrt{h^2 + 1} + 1)(\sqrt{h^2 + 1} - 1) &= (\sqrt{h^2 + 1})^2 - \sqrt{h^2 + 1} + \sqrt{h^2 + 1} - 1 \\ &= h^2 + 1 - 1 \\ &= h^2\end{aligned}$$

- *Q126*: Factor completely  $(a^2 + 2a)^2 - 2(a^2 + 2a) - 3$ .

To make this simple, let  $b = a^2 + 2a$ . Then factor.

$$\begin{aligned}b^2 - 2b - 3 &= (b - 3)(b + 1) \\ &= (a^2 + 2a - 3)(a^2 + 2a + 1) \\ &= [(a + 3)(a - 1)][(a + 1)^2] \\ &= (a + 1)^2(a - 1)(a + 3)\end{aligned}$$

### Section 1.4: 64,72,84

- *Q64*: Simplify:

$$\begin{aligned}&\frac{\frac{x-3}{x-4} - \frac{x+2}{x+1}}{x+3} \\ &= \frac{1}{x+3} \left( \frac{x-3}{x-4} - \frac{x+2}{x+1} \right) \\ &= \frac{1}{x+3} \left( \frac{(x-3)(x+1)}{(x+1)(x-4)} - \frac{(x+2)(x-4)}{(x+1)(x-4)} \right) \\ &= \frac{1}{x+3} \left( \frac{(x-3)(x+1) - (x+2)(x-4)}{(x+1)(x-4)} \right) \\ &= \frac{1}{x+3} \left( \frac{x^2 - 2x - 3 - (x^2 - 2x - 8)}{(x+1)(x-4)} \right) \\ &= \frac{1}{x+3} \left( \frac{\cancel{x^2} - \cancel{2x} - 3 - \cancel{x^2} + \cancel{2x} + 8}{(x+1)(x-4)} \right) \\ &= \frac{5}{(x+1)(x-4)(x+3)}\end{aligned}$$

- Q72: Simplify:

$$\begin{aligned}
 & 1 + \frac{1}{1 + \frac{1}{1+x}} \\
 &= 1 + \frac{1}{\frac{1+x}{1+x} + \frac{1}{1+x}} \\
 &= 1 + \frac{1}{\frac{1+x+1}{1+x}} \\
 &= 1 + \frac{1}{\frac{x+2}{x+1}} \\
 &= 1 + \frac{x+1}{x+2} \\
 &= \frac{x+2}{x+2} + \frac{x+1}{x+2} \\
 &= \frac{x+2+x+1}{x+2} \\
 &= \frac{2x+3}{x+2}
 \end{aligned}$$

- Q84: Simplify:

$$\begin{aligned}
 & \frac{(7-3x)^{\frac{1}{2}} + \frac{3}{2}x(7-3x)^{-\frac{1}{2}}}{7-3x} \\
 &= (7-3x)^{-1} \left( (7-3x)^{\frac{1}{2}} + \frac{3}{2}x(7-3x)^{-\frac{1}{2}} \right) \\
 &= [(7-3x)^{-1}] (7-3x)^{-\frac{1}{2}} \left( (7-3x) + \frac{3}{2}x \right) \\
 &= (7-3x)^{-\frac{3}{2}} \left( -\frac{6}{2}x + \frac{3}{2}x + 7 \right) \\
 &= (7-3x)^{-\frac{3}{2}} \left( -\frac{3}{2}x + \frac{14}{2} \right) \\
 &= \frac{-3x+14}{2(7-3x)^{\frac{3}{2}}}
 \end{aligned}$$