

Precalculus Worksheet

(1)

$$1. \quad (x+a)(x-a) = x^2 + ax - ax + a^2 = x^2 - a^2$$

$$\text{Ex a) } (x+2)(x-2) = x^2 - 4$$

$$\text{b) } (\sqrt{x}+1)(\sqrt{x}-1) = x-1$$

$$\begin{aligned} \text{c) } \frac{\sqrt{x}-1}{x-1} &= \frac{\sqrt{x}-1}{x-1} \cdot \frac{\sqrt{x}+1}{\sqrt{x}+1} = \frac{x-1}{(x-1)(\sqrt{x}+1)} \\ &= \frac{1}{\sqrt{x}+1} \quad (x \neq 1) \end{aligned}$$

$$\begin{aligned} \text{d) } (\sqrt{x+1}+2)(\sqrt{x+1}-2) &= (x+1)-4 \\ &= x-3 \end{aligned}$$

2. Find roots of a quadratic form.

$$\text{Ex a) } x^2 - 2x - 8 = 0$$

$$x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{2 \pm \sqrt{4 - 4 \cdot (1) \cdot (-8)}}{2} = \frac{2 \pm \sqrt{36}}{2}$$

$$= \frac{2 \pm 6}{2}$$

$$x_1 = -2, \quad x_2 = 4 \quad (\text{see next page})$$

$$b) \quad x^2 - 2x - 8 = 0$$

(2)

$$\Leftrightarrow (x-4)(x+2) = 0$$

$$\Leftrightarrow x-4=0 \quad \text{or} \quad x+2=0$$

$$\Leftrightarrow x_1 = 4, \quad x_2 = -2$$

$$c) \quad x(x+1) = 2$$

$$\Leftrightarrow x(x+1) - 2 = 0$$

$$\Leftrightarrow x^2 + x - 2 = 0$$

$$\Leftrightarrow x_{1,2} = \frac{-1 \pm \sqrt{1+8}}{2} = \frac{-1 \pm 3}{2}$$

$$\Leftrightarrow x_1 = -2, \quad x_2 = 1$$

Extra problems: simplify the following expressions

$$a) \quad \frac{\sqrt{x+1} - 1}{x}$$

$$b) \quad |x|$$

$$c) \quad \frac{\frac{1}{x} - \frac{1}{x+1}}{\frac{1}{x}}$$

$$d) \quad (x+1)^2 - 1$$