Assignment 4bis

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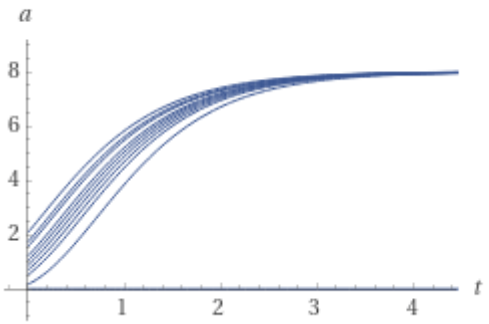
Here for visualization $k = 0.5$ is used.

Variation 1

$$\frac{\mathrm{d}A}{\mathrm{d}t} = k\sqrt{A} \cdot (8 - A)$$

Sample solution family

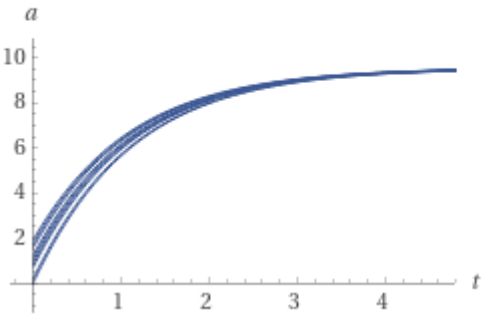


(sampling $a(0)$)

Variation 2

$$\frac{\mathrm{d}A}{\mathrm{d}t} = k\sqrt{A} + (8 - A)$$

Sample solution family

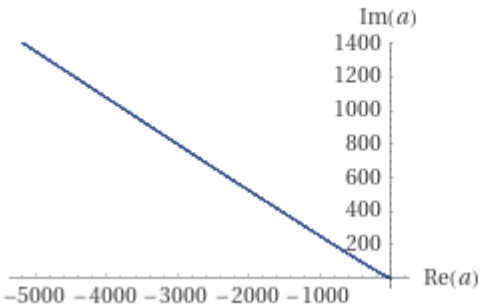


(sampling $a(0)$)

Variation 3

$$\frac{\mathrm{d}A}{\mathrm{d}t} = k\sqrt{A} - (8 - A)$$

Sample solution family

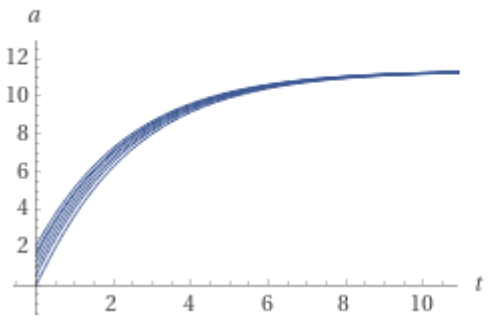


(sampling $a(0)$)

Variation 4

$$\frac{\mathrm{d}A}{\mathrm{d}t} = k(\sqrt{A} + (8 - A))$$

Sample solution family

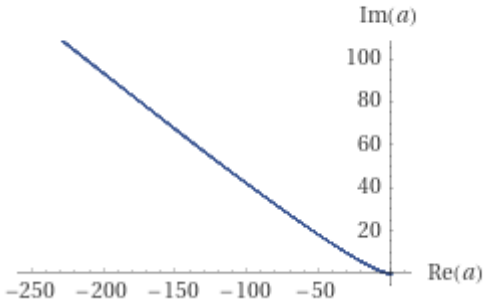


(sampling $a(0)$)

Variation 5

$$\frac{\mathrm{d}A}{\mathrm{d}t} = k(\sqrt{A} - (8 - A))$$

Sample solution family



(sampling $a(0)$)

Final answer

The correct version is the product (variation 1), because it yields solutions asymptotically monotonously growing up to 8.

$$\frac{\mathrm{d}A}{\mathrm{d}t} = k\sqrt{A} \cdot (8 - A)$$

$$\lim_{A \to 8} \frac{\mathrm{d}A}{\mathrm{d}t} = \lim_{A \to 8} \left(k\sqrt{A} \cdot (8 - A) \right) = 0$$

Thus the slope of the solutions decreases to 0 when A reaches 8. This is quite intuitive.