# Math 118 – Homework # 5 SOLUTION
## CiC, p. 192, # 1abce,2e,5 (5 points)

**CiC, p. 192, # 1.**

a. $y = \dfrac{1}{\frac{1}{5} - t}$

Checking the differential equation: $\dfrac{dy}{dt} = \dfrac{1}{(\frac{1}{5} - t)^2}$

$$y^2 = \frac{1}{(\frac{1}{5} - t)^2} \qquad \text{so } y' = y^2.$$

Checking initial condition: $y(0) = \dfrac{1}{\frac{1}{5} - 0} = 5.$

b. $y = \dfrac{1}{\sqrt{\frac{1}{25} - 2t}}$

Checking the differential equation: $\dfrac{dy}{dt} = -\dfrac{1}{2}\dfrac{(-2)}{(\frac{1}{25} - 2t)^{3/2}}$

$$y^3 = \frac{1}{(\frac{1}{25} - 2t)^{3/2}} \qquad \text{so } y' = y^3.$$

Checking initial condition: $y(0) = \dfrac{1}{\sqrt{\frac{1}{25} - 0}} = 5.$

c. $y = \dfrac{1}{\sqrt[3]{\frac{1}{125} - 3t}}$

Checking the differential equation: $\dfrac{dy}{dt} = -\dfrac{1}{3}\dfrac{(-3)}{(\frac{1}{125} - 3t)^{4/3}}$

$$y^4 = \frac{1}{(\frac{1}{125} - 3t)^{4/3}} \qquad \text{so } y' = y^4.$$

Checking initial condition: $y(0) = \dfrac{1}{\sqrt[3]{\frac{1}{125} - 0}} = 5.$

e. A general solution to the IVP $y' = y^n;\ y(0) = C$ for integer $n > 1$ and constant $C > 0$ is

$$y(t) = \frac{1}{\sqrt[n]{\frac{1}{C^n} - nt}}.$$

**CiC, p. 192, # 2.**

e. A general solution to the IVP $y' = t^n;\ y(0) = C$ for integer $n > 1$ and constant $C$ is

$$y(t) = \frac{t^{n+1}}{n+1} + C.$$

**CiC, p. 193, # 5.**

a. $17 = y(3) = \sqrt{3 + C}$ so $C = 17^2 - 3 = 286$.

b. $-5 = y(0) = \dfrac{-1}{0 + C}$ so $C = 1/5$.

c. $3 = y(2) = \dfrac{-1}{2 + C}$ so $C = -7/3$.