Consider the differential equation $\frac{d y}{d x}=1-y$. Let $\mathrm{y}=\mathrm{f}(\mathrm{x})$ be the particular solution to this differential equation with the initial condition $f(1)=0$. For this particular solution, $\mathrm{f}(\mathrm{x})<1$ for all values of $x$.
a) Use Euler's Method, starting at $x=1$ with two steps of equal size, to approximate $f(0)$. Show the work that leads to your answer.

Consider the differential equation $\frac{d y}{d x}=3 x+2 y+1$.
b) Let $y=f(x)$ be a particular solution to the differential equation with the initial condition $f(0)=-2$. Use Euler's method, starting at $x=0$ with a step size of .5 , to approximate $f(1)$. Show the work that leads to your answer.

Consider the differential equation $\frac{d y}{d x}=5 x^{2}-\frac{6}{y-2}$ for $y \neq 2$. Let $\mathrm{y}=\mathrm{f}(\mathrm{x})$ be the particular solution to this differential equation with the initial condition $f(-1)=-4$.
d) Use Euler's Method, starting at $x=-1$ with two steps of equal size, to approximate $f(0)$. Show the work that leads to your answer.

Let f be the function satisfying $f^{\prime}(x)=-3 x f(x)$, for all real numbers x , with $\mathrm{f}(1)=4$ and $\lim _{x \rightarrow \infty} f(x)=0$.
a) Use Euler's Method, starting at $x=1$ with a step size of .5, to approximate $f(2)$.

Let f be the function whose graph goes through the point $(3,6)$ and whose derivative is given by $f^{\prime}(x)=\frac{1+e^{x}}{x^{2}}$
b) Use Euler's Method, starting at $\mathrm{x}=3$ with a step size of .05 , to approximate $\mathrm{f}(3.1)$. Use $f^{\prime \prime}$ to explain why this approximation is less $f(3.1)$.

## 2013 BC5

Consider the differential equation $\frac{d y}{d x}=y^{2}(2 x+2)$. Let $\mathrm{y}=\mathrm{f}(\mathrm{x})$ be the particular solution to the differential equation with initial condition $f(0)=-1$.
a) Use Euler's method, starting at $x=0$ with two steps of equal size, to approximate $f(.5)$.
7. Given that $\mathrm{y}(1)=-3$ and $\frac{d y}{d x}=2 \mathrm{x}+\mathrm{y}$, what is the approximation for $\mathrm{y}(2)$ if Euler's Method is used with step size of .5 , starting at $x=1$.
A) -5
B) -4.25
C) -4
D) -3.75
E) -3.5

Let $\mathrm{y}=\mathrm{f}(\mathrm{x})$ be the solution to the differential equation $\frac{d y}{d x}=x-y$ with initial condition $\mathrm{f}(1)=3$. What is the approximation for $\mathrm{f}(2)$ obtained by using Euler's Method with two steps of equal length starting at $\mathrm{x}=1$ ?
A) $\frac{-5}{4}$
B) 1
C) $\frac{7}{4}$
D) 2
E) $\frac{21}{4}$
7. Let $\mathrm{y}=\mathrm{f}(\mathrm{x})$ be the solution to the differential equation $\frac{d y}{d x}=x-y-1$ with the initial condition $f(1)=-2$. What is the approximation for $f(1.4)$ if Euler's Method is used, starting at $x=1$ with two steps of equal size.
A) -2
B) -1.24
C) -1.2
D) -0.64
E) 0.2

