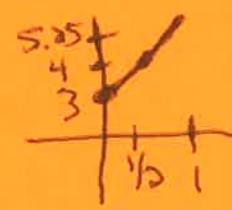
1.) a.) $\frac{dy}{dx} = x+2$

Start $(0,3)$ $f(\tfrac{1}{2}) \approx 3 + (0+2)(1/2) = 4$

$(\tfrac{1}{2}, 4)$ $f(1) \approx 4 + (\tfrac{1}{2}+2)(\tfrac{1}{2}) = 5.25$

$(1, 5.25)$ $f(1) \approx 5.25$



b.) $dy = (x+2)\,dx$ $(0,3)$ I.C.

$\int dy = \int (x+2)\,dx$

$y = \frac{1}{2}x^2 + 2x + C$

$3 = \frac{1}{2}(0)^2 + 2(0) + C \rightarrow C = 3$

$y = \frac{1}{2}x^2 + 2x + 3$

$y(1) = \frac{1}{2} + 2 + 3 = 5.5$

c.) error $= |5.25 - 5.5| = .25$

Use a smaller step size (more steps)

2.) Start $(2,5)$ $f(2.5) \approx 5 + (0.4)(.5) = 5.2$

$(2.5, 5.2)$ $f(3) \approx 5.2 + (0.6)(.5) = 5.5$

$(3, \underline{5.5})$ $f(3) \approx 5.5$

3.) $\frac{dy}{dx} = \frac{1}{x+2}$

Start $(0,1)$ $f(.5) \approx 1 + \frac{1}{0+2}(.5) = 1.25$

$(.5, 1.25)$ $f(1) \approx 1.25 + \frac{1}{.5+2}(.5) = 1.45$

$(1, \underline{1.45})$ $f(1) \approx 1.45$

4.) $\frac{dy}{dx} = x+y$

Start $(1,3)$ $f(1.5) \approx 3 + (1+3)(.5) = 5$

$(1.5, 5)$ $f(2) \approx 5 + (1.5+5)(.5) = 8.25$

$(2, \underline{8.25})$ $f(2) \approx 8.25$

5.) $\frac{dy}{dx} = 4x+y$

Start $(2,0)$ $f(2.5) \approx 0 + (4(2)+0)(.5) = 4$

$(2.5, 4)$ $f(3) \approx 4 + (4(2.5)+4)(.5) = 11$

$(3, \underline{11})$ $f(3) \approx 11$

6.) Start $(4,2)$ $f(4.2) \approx 2 + (-.5)(.2) = 1.9$

$(4.2, 1.9)$ $f(4.4) \approx 1.9 + (-.3)(.2) = 1.84$

$(4.4, \underline{1.84})$ $f(4.4) \approx 1.84$

7.) Start $(-2,3)$ $f(-.5) \approx 3 + (-.8)(1.5) = 1.8$

$(-.5, 1.8)$ $f(1) \approx 1.8 + (0.4)(1.5) = 2.4$

$(1, \underline{2.4})$ $f(1) \approx 2.4$

8.) $\frac{dy}{dx} = x + 2y$

Start $(0,1)$ $f(-.3) \approx 1 + (0+2)(-.3) = 0.4$

$(-.3, .4)$ $f(-.6) \approx (.4) + (-.3+.8)(-.3) = .25$

$(-.6, \underline{.25})$ $f(-.6) \approx .25$

9.)

b.) $\frac{dy}{dx} = 0$ when $x = \ln\left(\frac{3}{2}\right)$

$2x - y = 0$ when $x = \ln\left(\frac{3}{2}\right)$

$2\left(\ln\left(\frac{3}{2}\right)\right) - y = 0$

$y = 2\ln\left(\frac{3}{2}\right)$ or $y = \ln\left(\frac{9}{4}\right)$

c.) $\frac{dy}{dx} = 2x - y$

start $(0,1)$ $f(-.2) \approx 1 + (2(0)-1)(-.2) = 1.2$

$(-.2, 1.2)$ $f(-.4) \approx 1.2 + (2(-.2)-1.2)(-.2) = 1.52$

$(-.4, 1.52)$ $f(-.4) \approx 1.52$

d.) $\frac{d^2y}{dx^2} = 2 - \frac{dy}{dx} = 2 - (2x - y) = 2 - 2x + y$

$\left.\frac{d^2y}{dx^2}\right|_{(0,1)} = 2 - 2(0) + 1 = 3$

since $y = f(x)$ is concave up $\left(\frac{d^2y}{dx^2} > 0\right)$ at $(0,1)$ the tangent lines are below the curve producing an underapproximation.

10.) $\frac{dy}{dx} = 6x^2 - x^2y$

a.) Start $(-1,2)$ $f(-.5) \approx 2 + (4)(.5) = 4$

$(-.5, 4)$ $f(0) \approx 4 + (.5)(.5) = 4.25$

$(0, \underline{4.25})$ $f(0) \approx 4.25$

b.) $\frac{dy}{dx} = 6x^2 - x^2y$ $(-1,2)$ I.C.

$\frac{dy}{dx} = x^2(6-y) \rightarrow \frac{dy}{6-y} = x^2 dx$

$\int \frac{dy}{6-y} = \int x^2 dx$

$-\ln|6-y| = \frac{1}{3}x^3 + C$

$-\ln|4| = -\frac{1}{3} + C \rightarrow C = \frac{1}{3} - \ln 4$

$-\ln|6-y| = \frac{1}{3}x^3 + \frac{1}{3} - \ln 4$

$\ln|6-y| = -\frac{1}{3}x^3 - \frac{1}{3} + \ln 4$

$e^{-\frac{1}{3}x^3 - \frac{1}{3} + \ln 4} = 6 - y$

$y = 6 - e^{-1/3x^3 - \frac{1}{3} + \ln 4}$