QUIZ 4, Section H 4th October 2005

Name:_____ grade: ____

1. Decide which functions below satisfy the differential equation $y' + y^2 = 0$.

A. $y = Ae^x$, A a constant.

B. $y = A\sin x + B\cos x$, A, B constants.

C. $y = \ln x$

D. $y = \tan x$

E. $y = x^{-1}$

The equation is separable, so we solve it:

$$y' = -y^2$$

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

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

$$\frac{1}{y} = x + C'$$

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

if $C = 0$, this is choice E

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Name:_____ grade: ____

2. Use Euler's method with step-size 0.1 to compute $y(0.2)$ for the initial value problem $y' = x + y$ with $y(0) = 1$.

$h = .1$, $y' = F(x,y) = x+y$.

$y(0) = y_0 = 1$

$x_0 = 0$.

$y_1 = y_0 + F(x_0,y_0)\,h = 1 + (1+0)(.1)$

$= 1 + .1 = 1.1$.

$(x_1, y_1) = (.1, 1.1)$

$y_2 = y_1 + F(x_1,y_1)\,h = 1.1 + (.1+1.1)(.1)$

$= 1.1 + (1.2)(.1)$

$= 1.1 + .12$

$= 1.22$.

$y_2 \approx y(.2) = 1.22$.

QUIZ 4, Section M 4th October 2005

Name:_____ grade: ____

1. Decide which functions below satisfy the differential equation $xy' = 1$.

   A. $y = Ae^x$, A a constant.

   B. $y = A\sin x + B\cos x$, A, B constants.

   C. $y = \ln x$

   D. $y = \tan x$

   E. $y = x^{-1}$

The equation is separable, so solve:

$$\frac{dy}{dx} = \frac{1}{x}$$

$$\int dy = \int \frac{dx}{x}$$

$$y = \ln x + C$$

If $C = 0$ the ~~Missed~~ function that satisfies this is [C]

QUIZ 4, Section M 4th October 2005

Name:_____ grade: ____

2. Use Euler's method with step-size 0.1 to compute $y(0.2)$ for the initial value problem $y' = x - y$ with $y(0) = 1$.

$(x_0, y_0) = (0, 1)$ $y_0 = y(0) = 1$.

$F(x,y) = y' = x - y$. $h = .1$.

$y_1 = y(.1) \approx y_0 + F(x_0, y_0)h$

$= 1 + (0 - 1)(.1)$

$= 1 - .1 = .9$

$(x_1, y_1) = (.1, .9)$

$y_2 \approx y(.2) = y_1 + F(x_1, y_1)h$

$= .9 + (.1 - .9).1$

$= .9 + (-.08)$

$= .82$

QUIZ 4, Section T 4th October 2005

Name:_____ grade: ____

1. Decide which functions below satisfy the differential equation $y'' + y = 0$.

   A. $y = Ae^x$, A a constant.

   B. $y = A\sin x + B\cos x$, A, B constants.

   C. $y = \ln x$

   D. $y = \tan x$

   E. $y = x^{-1}$

That is, which functions satisfy $y'' = -y$.

Differentiating each of the above functions twice, we see that only the functions: $y = A\sin x + B\cos x$ satisfies the equation, since;

A.: $y'' = Ae^x$, $y'' \neq -y$.

B: $y'' = -A\sin x - B\cos x = -(y)$

C. $y'' = -\frac{1}{x^2} \neq -y$

D. $y' = \sec^2 x$, $y'' = 2\sec^2 x \tan x \neq -y = -\tan x$

E. $y'' = \frac{2}{x^3} \neq -y = -\frac{1}{x}$.

QUIZ 4, Section T 4th October 2005

Name:_____ grade: ____

2. Use Euler's method with step-size 0.1 to compute $y(0.2)$ for the initial value problem $y' = y$ with $y(0) = 1$.

$(x_0, y_0) = (0, 1)$

$y' = F(x,y) = y$, $h = .1$

$y_1 = y(.1) = y_0 + F(x_0, y_0)(.1)$

$= 1 + 1(.1)$

$= 1.1$

$(x_1, y_1) = (.1, 1.1)$

$y_2 = y(.2) = y_1 + F(x_1, y_1)h$

$= 1.1 + (1.1)(.1)$

$= 1.1 + .11$

$= 1.21$