BC Calculus
Differential Equations
Solve the differential Equation.

Name__________________________Pd.__
Additional Differential Equations Day 1

1. $\frac{dy}{dx} = xe^{-y}$

2. $\left(y^2 + xy^2\right)y' = 1$

3. $\left(y + \sin y\right)y' = x + x^3$

4. $\frac{dz}{dt} + e^{t+z} = 0$

Find the solution of the differential equation that satisfies the given initial condition.

5. $\frac{dy}{dx} = \frac{x}{y}, \quad y(0) = -3$

6. $\frac{dy}{dx} = \frac{\ln x}{xy}, \quad y(1) = 2$

BC Calculus — Name________________________Pd.__

Differential Equations — Additional Differential Equations Day 1

Find the solution of the differential equation that satisfies the given initial condition.

7. $\frac{du}{dt} = \frac{2t + \sec^2 t}{2u}$, $u(0) = -5$

8. $\frac{dP}{dt} = \sqrt{Pt}$, $P(1) = 2$

Review:

R1. What is the instantaneous rate of change for $f(x) = \frac{x^3 + 3x^2 + 3x + 1}{x+1}$ at $x = 2$?

a. -27
b. -6
c. 6
d. 9
e. 27

R2. $\left(\frac{d}{dx}\right)\left(e^{\sin 2x}\right) =$

a. $-\cos(2x)e^{\sin 2x}$
b. $\cos(2x)e^{\sin 2x}$
c. $2e^{\sin 2x}$
d. $2\cos(2x)e^{\sin 2x}$
e. $-2\cos(2x)e^{\sin 2x}$

R3. If $f(x) = \tan^2 x + \sin x$, then $f'\left(\frac{\pi}{4}\right) =$

a. $\frac{4+\sqrt{2}}{2}$ b. $\frac{2+\sqrt{2}}{2}$ c. $\frac{8+\sqrt{2}}{2}$

d. $\frac{8-\sqrt{2}}{2}$ e. $\frac{4-\sqrt{2}}{2}$

R4. If $f(x) = \tan\left(e^{\sin x}\right)$, then f'(x)=

a. $-e^{\sin x}\cos x \sec^2\left(e^{\sin x}\right)$
b. $e^{\sin x}\cos x \sec^2\left(e^{\sin x}\right)$
c. $-e^{\sin x}\sec\left(e^{\sin x}\right)\tan\left(e^{\sin x}\right)$
d. $e^{\sin x}\sec^2\left(e^{\sin x}\right)$
e. $e^{\sin x}\sec\left(e^{\sin x}\right)\tan\left(e^{\sin x}\right)$

Answers:

1. $y = \ln\left(\frac{1}{2}x^2 + C\right)$	5. $y = -\sqrt{x^2+9}$	R1. C
2. $y = \sqrt[3]{3\ln\lvert 1+x\rvert + C}$	6. $y = \sqrt{(\ln x)^2 + 4}$	R2. D
3. $\frac{1}{2}y^2 - \cos y = \frac{1}{2}x^2 + \frac{1}{4}x^4 + C$	7. $u = -\sqrt{t^2 + \tan t + 25}$	R3. C
4. $z = -\ln\left(e^t + C\right)$	8. $p = \left(\frac{1}{3}t^{\frac{3}{2}} + \sqrt{2} - \frac{1}{3}\right)^2$	R4. B