80 pts.

Problem 1. In each part, find the general solution of the differential equation.

A.

$$\frac{dy}{dx} = x\sqrt{y}.$$

B.

$$\frac{dy}{dx} + \frac{3}{x}y = x^5.$$

C.

$$\frac{dy}{dx} + 3y = e^x y^3.$$

D.

$$\frac{dy}{dx} = \frac{x^2 + 2y^2}{xy}.$$

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20 pts.

Problem 2. The following equation is exact. Solve it.

$$(2xy + y^2)\,dx + (x^2 + 2xy + 3y^2)\,dy = 0$$

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30 pts.

Problem 3. Find an integrating factor and use it to solve the equation

$$y\,dx + (x + xy)\,dy = 0.$$

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30 pts.

Problem 4. Solve the differential equation

$$(x - 1)\,dx + (x + y + 1)\,dy = 0$$

by the substitution $x = u + h$ and $y = v + k$, where h and k are constants to be determined.

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40 pts.

Problem 5. A projectile with a mass of 1 slug (i.e., the weight is $mg =$ 32 pounds) is fired straight up from ground level at a velocity of 200 feet per second. The force of air resistance on the projectile is $-2v$, where v is the velocity of the projectile.

How long does it take for the projectile to come to rest at the top of its trajectory. How high does it go? [Give numerical answers accurate to two decimal places.]

EXAM

Exam #1

Math 3350, Spring 2006

Feb 16, 2005

- Write all of your answers on separate sheets of paper. You can keep the exam questions when you leave. You may leave when finished.
- You **must** show enough work to justify your answers. Unless otherwise instructed, give exact answers, not approximations (e.g., $\sqrt{2}$, not 1.414).
- This exam has 5 problems. There are **200 points total**.

Good luck!