Math 2300 Honors - Final Review Questions

Fall 2012

December 14th, 2012

Question 1

Which of the following differential equations has $\sin(x) + e^x$ as a solution?

A. $\frac{dy}{dx} = y$

B. $\frac{d^2y}{dx^2} = -y$

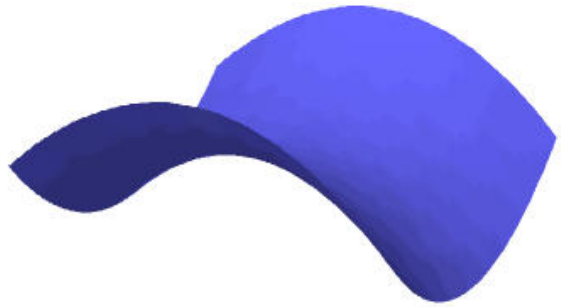
C. $\frac{d^2y}{dx^2} = y$

D. $\frac{d^4y}{dx^4} = y$

E. $\frac{d^4y}{dx^4} = -y$

Question 2

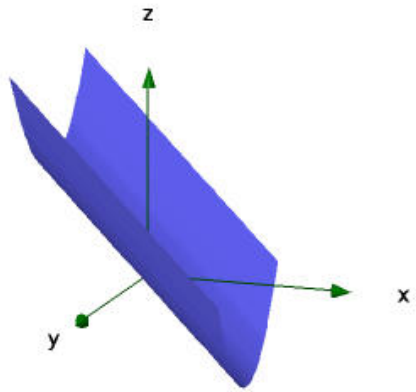
Which of the following is false of the function $f(x, y)$ in the picture (it's a hyperbolic paraboloid $z = x^2 - y^2$):



A. The z-constant traces are hyperbolas
B. It has parabolic x-constant traces
C. It has non-zero partial derivatives everywhere
D. It contains at least one straight line
E. The integral of this function over the unit square in the xy-plane is zero

Question 3

Which of the functions is shown in the picture?



A. $z = x^2 - y$

B. $z = x^2 + y$

C. $z = y^2 - x$

D. $z = y^2 + x$

E. $z = \sin(e^{xy+\cos(y^{17})})$

Question 4

If $f(x, y)$ has $f_x(x, y) = 3$ and $f_y(x, y) = 7$, then ...

A. $f(x, y)$ is constant

B. $f(x, y)$ cannot possibly exist

C. $f(x, y)$ has a maximum value of 21

D. $f(x, y)$ is a plane

E. $f(x, y)$ is a hyperbola

Question 5

If $P(t)$, the quantity of edible foods in your fridge as a function of time t, in days, exhibits exponential decay ($\frac{dP}{dt} = kt$ for some $k < 0$), then which of the following information will determine the function $P(t)$ completely?

A. The value of k

B. The value $P(10)$

C. Two values $P(10)$ and $P(12)$

D. The half-life of your fridge-food

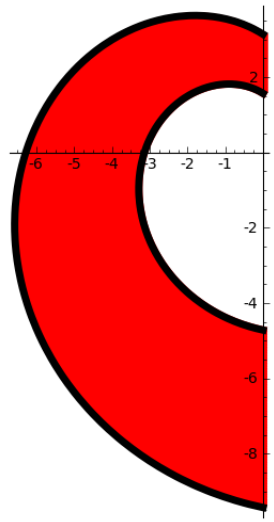
E. The half-life and the value of k

Question 6

Which of the following sorts of sequences cannot exist?

A. positive, increasing and bounded
B. convergent and alternating
C. divergent and alternating
D. bounded and alternating
E. decreasing, bounded below and divergent

Question 7



Which of the regions is shown in the picture?

A. $1 < r < 2, \pi/2 < \theta < 3\pi/2$

B. $\theta < r < \theta^2, \pi/2 < \theta < 3\pi/2$

C. $\theta < r < 2\theta, \pi/2 < \theta < 3\pi/2$

D. $\cos(\theta) < r < 2\cos(\theta), \pi/2 < \theta < 3\pi/2$

E. $\theta < r < \theta + 1, \pi/2 < \theta < 3\pi/2$

Question 8

$$\int_{-1}^{1} \int_{\sqrt{1-x}}^{\sqrt{2}} f(x,y)\, dydx$$

Which of the following will necessarily have the same answer?

A. $2\int_{0}^{1} \int_{\sqrt{1-x}}^{\sqrt{2}} f(x,y)\, dydx$

B. $\int_{-1}^{1} \int_{\sqrt{1-y}}^{\sqrt{2}} f(x,y)\, dxdy$

C. $\int_{-1}^{1} \int_{1}^{1-y^2} f(x,y)\, dxdy$

D. $\int_{0}^{\sqrt{2}} \int_{1-y^2}^{1} f(x,y)\, dxdy$

E. $\int_{-1}^{1} \int_{\sqrt{1-y^2}}^{1} f(x,y)\, dxdy$

Question 9

What's the sum of this series:

$$5 + 2/3 + 2/27 + \ldots + 2/3^{2N-1}$$

A. $5 + \frac{2(1-\frac{1}{3^{2N}})}{3(1-\frac{1}{9})}$

B. $5 + \frac{2(1-\frac{1}{3^{2N+1}})}{3(1-\frac{1}{9})}$

C. $5 + \frac{(1-\frac{1}{3^{2N}})}{(1-\frac{1}{9})}$

D. $5 + \frac{1-\frac{1}{3^{2N+1}}}{1-\frac{1}{9}}$

E. $5\frac{1-\frac{1}{3^{N+1}}}{1-\frac{1}{3}}$

Question 10

If you see a parade of hamsters walking down the street, one-by-one, which of the following facts, taken together (choose more than one if necessary), allows you to conclude that they are all tasty?

A. one of them is tasty

B. the first one is tasty

C. a tasty hamster is always followed by a tasty hamster

D. if you see a tasty hamster, the one before it was also tasty

E. you can't tell without frying them up

Answers

1. D
2. C
3. C
4. D
5. C
6. E
7. C
8. D
9. A
10. $\{B, C\}$ or $\{A, C, D\}$ or $\{A, B, C, D\}$