# Math 114 (Powers) 1½ Hour Test. Thursday February 12, 2009

Name(print)________________________________ Penn I.D. ____________________

Signature___________________________________

1. The function y(t) satisfies the differential equation $\frac{dy}{dt} = ky$ were k is a constant. If y(0) = 2, y(2) = 8 then what is y(3)? y(3) =

   A. $e^2$ B. 2e C. $2e^{-1/2}$ D. 10 E. 16## F. $2e^2$ G. $8\sqrt{2}$ H. 24

2. The function y(t) satisfies the differential equation $\frac{dy}{dt} = 3y(2 - y)$ If y(0) = 1 then as $t \to +\infty$ y(t) apprroaches what? $y(t) \to$

   A. $+\infty$ B. 0 C. 1/2 D. 1/3 E. 2## F. 3 G. 6 H. 4½

3. Suppose y satisfies the differential equation $\frac{dy}{dx} = -xy$ and y(0) = 2. Then what is y(2). y(2) =

   A. 2e B. $2e^{-2}$## C. $2e^{-1}$ D. e F. $4\sqrt{2}$ G. $2\sqrt{2}$ H. $\sqrt{2}$

4. Suppose y(t) satisfies the differential equations $(4+t)\frac{dy}{dt} + y = 4 + t$. and y(0) = 1. Then what is y(2)? y(2) =

   A. 0 B. e C. 7/3## D. 5/3 F. -1 G. 11/2 H. $\sqrt{2}$

5. Suppose y(x) satisfies the intergral equation $y(x) = 2 + \int_0^x \frac{1}{2}y(t)\,dt$. Then what is y(2)? (Hint. Differentiate) y(2) =

   A. $2e^{1/2}$ B. 2/e C. 2 D. $2e^2$ E. 2e## F. $2\sqrt{2}$ G. 4 H. 8/3

6. Find the distance from the plane 3x + 2y + z = 14 to the origin. Hint, find the point on the plane closest to the origin and find its distance from the origin. Distance =

   A. 1 B. $\sqrt{6}$ C. $\sqrt{11}$ D. $\sqrt{14}$## E. 4 F. $\sqrt{18}$ G. $2\sqrt{5}$ H. 6

7. Find where the plane through ⟨2,1,1⟩, ⟨1,2,1⟩ and ⟨1,1,2⟩ intersects the the x-axis. x-intersect =

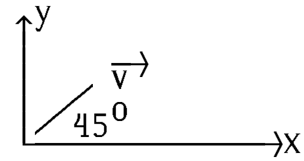
   A. -2 B. -1 C. 0 D. 1 E. 2 F. 3 G. 4## H. 5

8. Find where the straight line through ⟨1,0,1⟩ and ⟨0,-1,0⟩ passes through the plane x + y + z = 5. What is the x-coordinate of the point?

   A. -2 B. -1 C. 0 D. 1 E. 2## F. 3 G. 4 H. 5

9. Fine the plane equidistant from the points ⟨1,3,0⟩ and ⟨-1,1,2⟩. Where does this plane intersect the x-axis? x-intersect =

A. -2 B. -1 C. 0 D. 1## E. 2 F. 3 G. 4 H. 5




10. A ball is fired at an angle of $45^o$ with a speed of 48 feet per second. (i.e. $|\vec{v}| = 48$ ft/sec.) The initial position is ⟨0,0⟩ and the acceleration is constant and directed downward $\vec{a} = (0,-g)$ where $g = 32 ft/sec^2$. How many feet does the ball travel before it strikes the gound (i.e. y = 0)

A. 16 B. 24 C. 32 D. 48 E. 64 F. 72## G. 96 H. 128

11. Find the arc length of the curve $(t\sqrt{2}, e^t, e^{-t})$ from t = 0 to t = 2.

A. $2e^2$ B. $e^2-e^{-2}$## C. $e+1/e$ D. $2\ln(2)$ E. $4\sqrt{2}$ F. $e^{½}$ G. $\sqrt{2}(e-1)$

12. As θ goes from 0 to 2π the point (a·cos(θ), b·sin(θ)) goes around the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$. Find the curvature of the ellipse at x = 0, y = b or when θ = π/2 ($90^o$). Curvature =

A. $\frac{a}{a^2+b^2}$ B. $\frac{2a}{a^2+b^2}$ C. $\frac{b}{a^2+b^2}$ D. $\frac{2b}{a^2 \ddagger b^2}$ E. $\frac{b}{a^2}$## F. $\frac{a}{b^2}$ G. $\frac{1}{a}$ H. $\frac{1}{b}$

13. Consider the curve $\langle t, t^2, (2/3)t^3 \rangle$. Find the curvature at t = 1.

A. 0 B. 1 C. 2 D. 2/3 E. 4/3 F. 2/9## G. 2/5 H. 3/11