

Answers to Sample Test 2014

1. linear, third-order, homogeneous
2. Correct answer is (d).
3. Correct answer is (a).
4. Correct answer is (b).
5. Correct answer is (b).
6. Correct answer is (e).
7. Correct answer is (b).
8. Correct answer is (b).
9. Correct answer is (e).
10. Correct answer is (a).
11. Correct answer is (d).
12. $y(x) = e^{-x}(c_1 \cos(4x) + c_2 \sin(4x)) + \frac{9}{17}$
13. $y(x) = \frac{3}{2}e^{-x} - \frac{1}{2} \cos(x) + \frac{1}{2} \sin(x)$.

Answers to Sample Test 2016

1. Correct answer is (b).
2. Correct answer is (b).
3. Correct answer is (d).
4. Correct answer is (b).
5. Correct answer is (a).
6. Correct answer is (c).
7. Correct answer is (a).
8. Correct answer is (e).
9. Correct answer is (d).
10. Correct answer is (c).
11. The equation is of the first order, linear, non-autonomous. The initial-value problem has the solution $y(x) = e^{-x^2/2} \left(\frac{x^2}{2} \right)$.
12. (a) The function $f(t, x) = (\cos x)(\cos t)(\cos t + \sin x)$ and its partial derivative in x are continuous. Therefore, intersection of two solution curves would contradict the existence and uniqueness theorem.

(b) Constant solutions correspond to the values of x for which $f(t, x) = 0$, e.g., for $x = \frac{\pi}{2}$.

Answers to Sample Test 2018

1. Second-order, linear, inhomogeneous
2. The correct answer is (d)
3. $I(x) = e^{2x^3}$
4. $m_1 = -5$ and $m_2 = 2$
5. $t_0 = \frac{\log(4/6)}{\log(5/6)} \approx 2.22$ (minutes)
6. $a = -8$ and $b = 16$
7. The solutions are $y_1(x) = e^{-2x} \cos(\sqrt{5}x)$ and $y_2(x) = e^{-2x} \sin(\sqrt{5}x)$.
Their Wronskian for $x = 0$ is $\sqrt{5}$.
8. $y(x) = \frac{4}{1-4x^2}$ and the solution is defined for $x \in (-\frac{1}{2}, \frac{1}{2})$.
9. The general solution is $y(x) = 1 - x + ce^x$.
10. $y(x) = \frac{1}{2}x^2 - \frac{1}{2}x + \frac{3}{4}$.