

MathQuest: Differential Equations

Beats and Resonance

1. Which of the following forced 2nd order equations has solutions exhibiting *resonance*?

- (a) $y'' + y = \cos(t)$
- (b) $y'' + y = 2 \cos(t)$
- (c) $y'' + y = -2 \cos(t)$
- (d) All of the above
- (e) None of the above

2. Which of the following forced 2nd order equations has solutions exhibiting *resonance*?

- (a) $2y'' + y = \cos(t)$
- (b) $2y'' + 4y = 2 \cos(2t)$
- (c) $4y'' + y = -2 \cos(t/2)$
- (d) All of the above
- (e) None of the above

3. Which of the following forced 2nd order equations has solutions exhibiting *resonance*?

- (a) $y'' + 2y = 10 \cos(2t)$
- (b) $y'' + 4y = 8 \cos(2t)$
- (c) $y'' + 2y = 6 \cos(4t)$
- (d) All of the above
- (e) None of the above

4. Which of the following forced 2nd order equations has solutions clearly exhibiting *beats*?

- (a) $y'' + 2y = 10 \cos(t)$
- (b) $y'' + 1y = 2 \cos(2t)$
- (c) $y'' + 9y = 1 \cos(3t)$
- (d) All of the above
- (e) None of the above

5. The differential equation $y'' + 100y = 2 \cos(\omega t)$ has solutions displaying *resonance* when
- (a) $\omega = 10,000$
 - (b) $\omega = 10$
 - (c) $\omega = 9$
 - (d) All of the above
 - (e) None of the above
6. The differential equation $y'' + 100y = 2 \cos(\omega t)$ has solutions displaying *beats* when
- (a) $\omega = 10,000$
 - (b) $\omega = 10$
 - (c) $\omega = 9$
 - (d) All of the above
 - (e) None of the above
7. The differential equation $y'' + 4y = 2 \cos(2t)$ has solutions clearly displaying
- (a) beats
 - (b) damping
 - (c) resonance
 - (d) All of the above
 - (e) None of the above
8. The differential equation $4y'' + y = 2 \cos(4t)$ has solutions clearly displaying
- (a) beats
 - (b) damping
 - (c) resonance
 - (d) All of the above
 - (e) None of the above
9. The differential equation $4y'' + 4y = 2 \cos(t)$ has solutions clearly displaying
- (a) beats
 - (b) damping
 - (c) resonance
 - (d) All of the above
 - (e) None of the above