## **Honor Statement**

I affirm that my work upholds the highest standards of honesty and integrity, and that I have neither given nor received any unauthorized assistance on this exam.

Cianaluna		
Signature		

1	
2	
3	
4	
5	
total	

## *Instructions:*

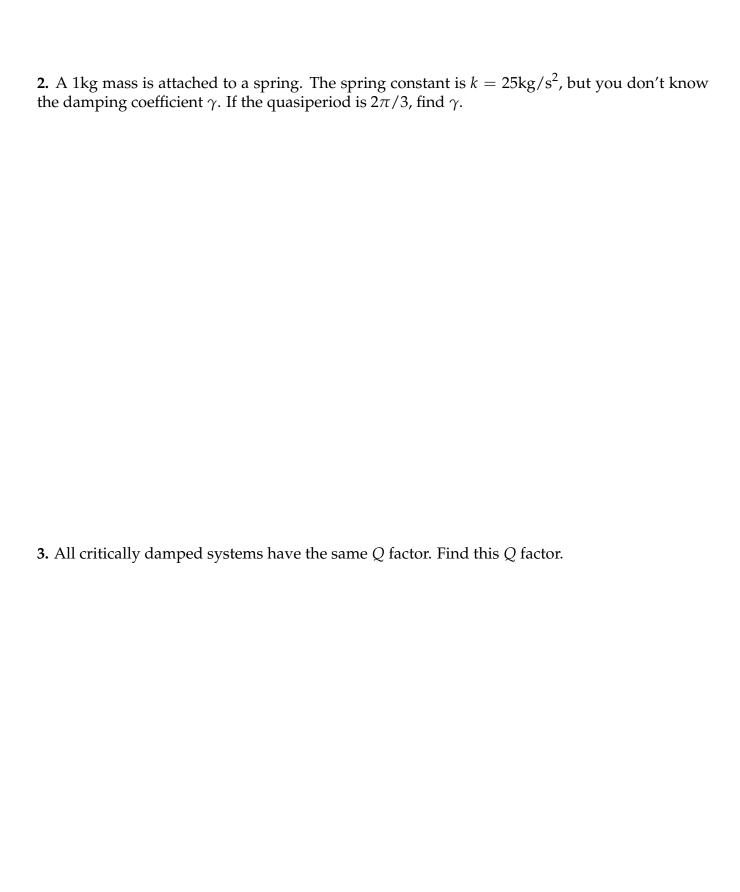
- Show all your work, and box your final answer.
- You may use one handwritten, double-sided  $8\frac{1}{2}$ " by 11" sheet of notes.
- No calculators, cell phones, headphones, or other electronics are allowed. You can include square roots and trigonometric functions in your answers.
- The value of g (acceleration due to gravity) is 9.8 m/s<sup>2</sup>, or 32 ft/s<sup>2</sup>.
- Your test should have 5 problems on 4 pages (not including this cover page) double-check that it does!
- Raise your hand if you have any questions.

Give it your best shot!

**1.** A 32-lb object is attached to a (giant) spring, stretching it by 8 ft. Assume that when the object is traveling at 3 ft/s, it experiences a damping force of 15 lb. There is also an external force of  $F(t) = 10\cos 2t + 10\sin 2t$  ft/s acting on the object.

At time t=0, you pull the object 1 ft downward, and release it with initial velocity 1 ft/s downward.

- (a) Find the amplitude and phase of the steady-state solution. (You may include square roots and trigonometric functions in your answer.)
- (b) Find the position of the object as a function of time.



**4.** Find the general solution to the ODE

$$y'' - 6y' + 9y = te^{3t} + e^{-t}.$$

**5.** Given that  $y_1(t) = t$  is a solution, find another solution to the ODE

$$t^2y'' - t(t+2)y' + (t+2)y = 0$$

that is not a multiple of t. What is the general solution?