

CHAPTER # 3

I This section covers all of the first two pages of this exam. For *each* problem, supply **domain, range, amplitude, period** and **phase shift (including direction word)** and **draw the graph in the areas provided**. Be sure your drawing crosses or approaches the Y-axis. You may do the work for this exam *directly on this* exam paper rather than on the “newsprint” as usual. If you do work on newsprint be sure it is labeled with its problem number. Remember, your graph *must* be on the axis provided. **Indicate significant coordinates.** You *may* use decimals for you coordinate responses (however you will probably spend more time using decimals than in not using decimals). Each problem in this section is worth 15 points.

A) $A(x) = 2 \sin\left(\frac{3}{4}x - \frac{3\pi}{16}\right) + 1$

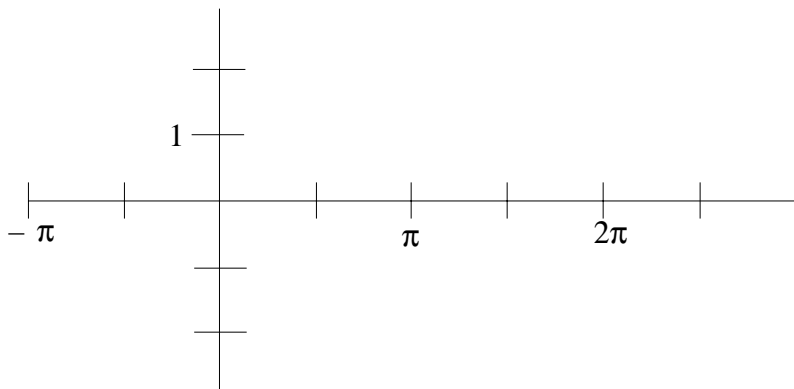
D_A

R_A

Per

Amp

P.S.



B) $B(x) = -\cos\left(\frac{2}{3}x + \frac{2\pi}{9}\right)$

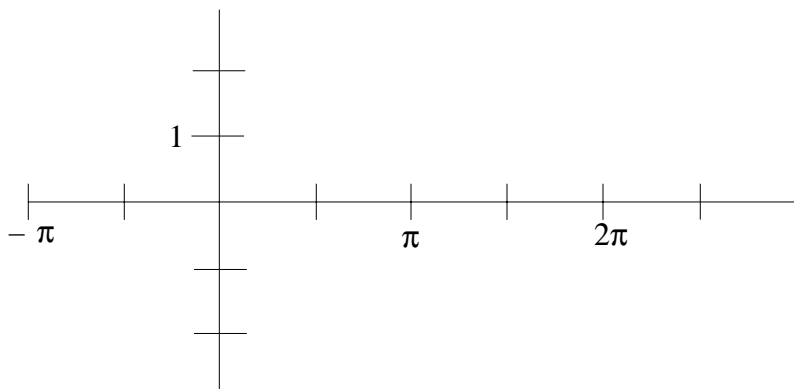
D_B

R_B

Per

Amp

P.S.



C) $C(x) = \csc\left(2x + \frac{\pi}{4}\right) + 1$

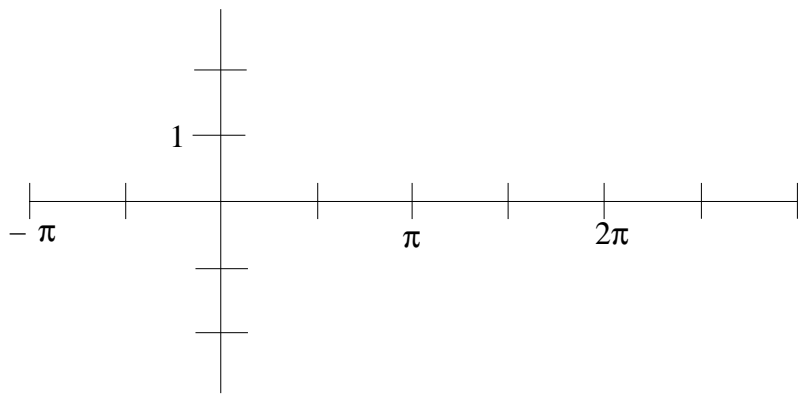
D_C

R_C

Per

Amp

P.S.



D) $D(x) = \tan \frac{4}{3} x$

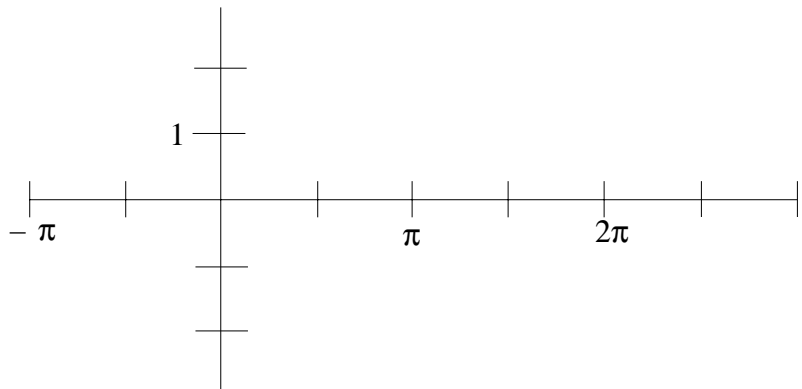
D_D

R_D

Per

Amp

P.S.



E) $E(x) = \sec \frac{2}{3} x$

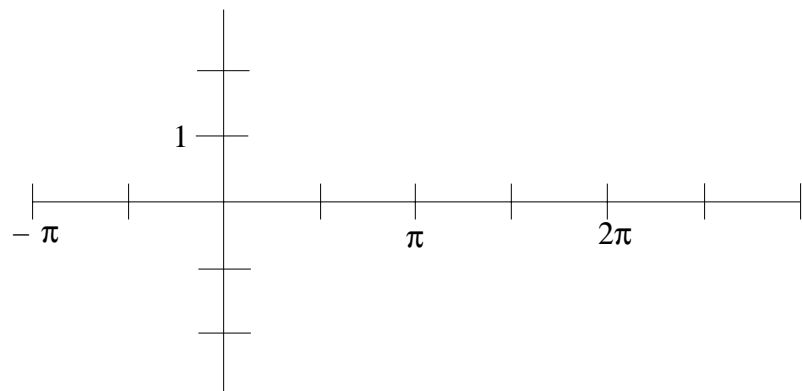
D_E

R_E

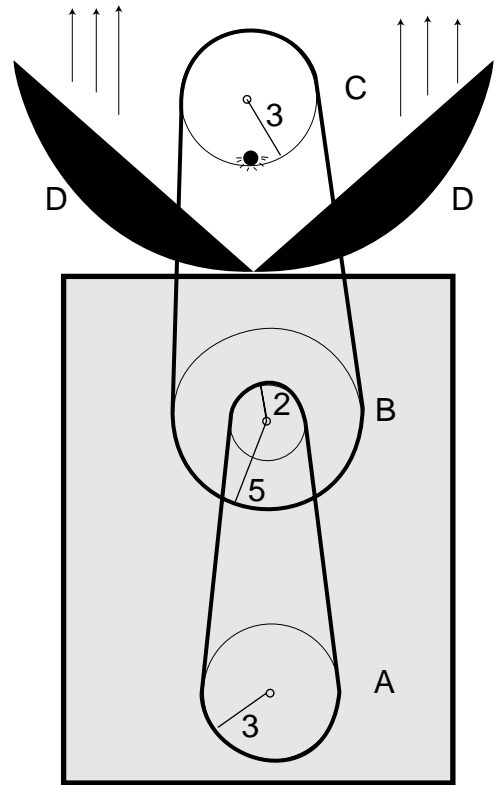
Per

Amp

P.S.



II The figure on the right is a rotating emergency light. The dot on wheel C is the light source. The black objects labeled D are mirrors which reflect the bright light upward. Wheel A is the motor wheel and it rotates at a constant speed of 15 RPM. Wheel B alters the speed of the rotating light slightly because it is connected to the light wheel by its 5 inch pulley and to the drive wheel by its 2 inch radius pulley. The drive wheel A and the rotating light wheel C each have a radius of 3 inches. (25 pts total)



When the motor is turned on, the red light is at the place indicated in the picture which is as close as it gets to the grey box, 5 inches away.

Your job is to answer the questions below. Include very brief justification for each section. Be sure *I* understand your logic. Your answers should be in seconds rather than minutes.

- A) Determine the angular velocity in seconds on wheel A .
- B) Determine the linear velocity in seconds on wheel A .
- C) Determine **both** linear velocities in seconds on wheel B . (careful... they *are* different.)
- D) Determine the linear velocity in seconds on wheel C .
- E) Determine the angular velocity in seconds on wheel C .
- F) Write the equation in terms of sine with a positive amplitude which describes the distance the dot on wheel C is from the shaded housing.
- G) Draw that graph of your function on the newsprint. The horizontal axis will be seconds and the vertical axis will represent the distance the "dot" is from the grey box. Specifically indicate the period, phase shift, axis movement and amplitude for your function. Indicate significant coordinates (as is usual for a graph).

Extra Credit 5 pts

For certain domain values, the functions $f(x) = \sin x$ and $g(x) = \sin 2x$ from $x = 0$ to $x = 2\pi$ have the same range value. For example, $f(\pi)$ and $g(\pi)$ both have the range value of zero, What are the other domain and range combinations?