



SCORE: ___ / 20 POINTS

What day of the month is your birthday?

What are the last 2 digits of your address?

What are the last 2 digits of your zip code?

What are the last 2 digits of your social security number?

[IF YOU DO NOT HAVE A SOCIAL SECURITY NUMBER,
USE YOUR STUDENT ID NUMBER]**NO CALCULATORS ALLOWED**Find the maximum and minimum values of r (and the corresponding values of θ) for $r = 5 \sin 3\theta$.

SCORE: ___ / 5 POINTS

$$r = 5 \text{ WHEN } \sin 3\theta = 1$$

$$0 \leq \theta < 2\pi$$

$$0 \leq 3\theta < 6\pi$$

$$3\theta = \frac{\pi}{2}, \frac{5\pi}{2}, \frac{9\pi}{2}$$

$$\theta = \frac{\pi}{6}, \frac{5\pi}{6}, \frac{3\pi}{2}$$

$$r = -5 \text{ WHEN } \sin 3\theta = -1$$

$$3\theta = \frac{3\pi}{2}, \frac{7\pi}{2}, \frac{11\pi}{2}$$

$$\theta = \frac{\pi}{2}, \frac{7\pi}{6}, \frac{11\pi}{6}$$

$\frac{1}{2}$ POINT EACH

Find all zeros of $r = 2 + 4 \cos \theta$.

SCORE: ___ / 3 POINTS

$$r = 0 \text{ WHEN } 2 + 4 \cos \theta = 0$$

$$\cos \theta = -\frac{1}{2}$$

$$\theta = \frac{2\pi}{3}, \frac{4\pi}{3}$$

Consider the conic $r = \frac{6}{2 - 3 \cos \theta} = \frac{3}{1 - \frac{3}{2} \cos \theta}$ $e = \frac{3}{2}$

SCORE: ___ / 6 POINTS

[a] Classify the type of the conic.

HYPERBOLA $\frac{1}{2}$

[b] Find the rectangular equation of the directrix.

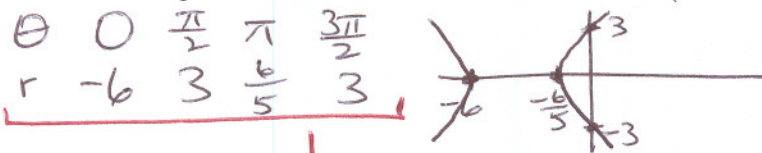
$$ep = 3$$

$$\frac{3}{2}p = 3$$

$$p = 2 \text{ LEFT OF POLE}$$

$$x = -2$$

[c] Find the rectangular coordinates of the other focus of the conic (ie. the focus that is NOT the pole).



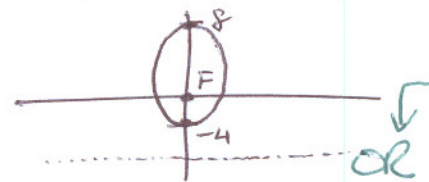
$$\text{CENTER} = \frac{1}{2}(-6 + -\frac{6}{5}) = -\frac{18}{5}$$

$$\text{FOCUS} = 2(-\frac{18}{5}) = -\frac{36}{5}$$

$$(0, -\frac{36}{5})$$

Find a polar equation for the ellipse with a focus at the pole, and vertices at $(8, \frac{\pi}{2})$ and $(4, \frac{3\pi}{2})$

SCORE: ___ / 6 POINTS



$$\text{CENTER} = \frac{1}{2}(8 + -4) = 2$$

$$e = \frac{c}{a} = \frac{2}{6} = \frac{1}{3}$$

$$r = \frac{ep}{1 - e \sin \theta}$$

$$8 = \frac{ep}{1 - e}$$

$$8(1 - e) = 4(1 + e)$$

$$8 - 8e = 4 + 4e$$

$$-12e = -4$$

$$e = \frac{1}{3}$$

$$4 = \frac{\frac{1}{3}p}{1 + \frac{1}{3}}$$

$$4 = \frac{p}{3+1} = \frac{p}{4}$$

$$p = 16$$

$$r = \frac{\frac{16}{3}}{1 + \frac{1}{3} \sin \theta}$$