Formulas

The following formulas will be provided with midterm 3:

- $\cos^2(x) + \sin^2(x) = 1 \qquad \tan^2(x) + 1 = \sec^2(x) \qquad \cot^2(x) + 1 = \csc^2(x)$
- $\sin(x + y) = \sin(x)\cos(y) + \cos(x)\sin(y)$
- $\cos(x + y) = \cos(x)\cos(y) - \sin(x)\sin(y)$
- $\tan(x + y) = \dfrac{\tan(x) + \tan(y)}{1 - \tan(x)\tan(y)}$
- $\sin(2x) = 2\sin(x)\cos(x)$
- $\cos(2x) = \cos^2(x) - \sin^2(x) = 2\cos^2(x) - 1 = 1 - 2\sin^2(x)$
- $\tan(2x) = \dfrac{2\tan(x)}{1 - \tan^2(x)}$
- $\sin(\frac{x}{2}) = \pm\sqrt{\dfrac{1 - \cos(x)}{2}}$; $\cos(\frac{x}{2}) = \pm\sqrt{\dfrac{1 + \cos(x)}{2}}$; $\tan(\frac{x}{2}) = \dfrac{1 - \cos(x)}{\sin(x)} = \dfrac{\sin(x)}{1 + \cos(x)}$
- Area of a triangle with sides of length a, b, and included angle θ: $\frac{1}{2}ab\sin(\theta)$
- $a + bi = r(\cos(\theta) + i\sin(\theta))$ where $r = \sqrt{a^2 + b^2}$ and $\tan(\theta) = \dfrac{b}{a}$
- Work W of a force $\mathbf{F}$ moving along a vector $\mathbf{D}$: $W = \mathbf{F} \cdot \mathbf{D}$
- Parabola with focus $(0, p)$ and vertex $(0, 0)$:

$$x^2 = 4py \ ; \quad \text{Directrix: } y = -p$$

- Ellipse with foci $(\pm c, 0)$ and vertices $(\pm a, 0)$:

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1, \qquad (a > b > 0; c > 0)$$
$$c^2 = a^2 - b^2 \ ; \qquad \text{Eccentricity: } e = \frac{c}{a}$$

- Hyperbola with foci $(\pm c, 0)$ and vertices $(\pm a, 0)$:

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1, \qquad (a > 0, b > 0)$$
$$c^2 = a^2 + b^2 \ ; \qquad \text{Asymptotes: } y = \pm\frac{b}{a}x$$

Students are responsible for the formulas below:

- The Laws of Sines and Cosines
- Dot product, angle between two vectors. Direction, magnitude, and components of vectors.