B

Useful Formulas

Algebra
Remember that the common algebraic operations have precedences relative to each other: for example, multiplication and division take precedence over addition and subtraction, but are “tied” with each other. In the case of ties, work left to right. This means, for example, multiplication and division take precedence over addition and subtraction, but it is also a bad idea to use too many parentheses.

Completing the square: \( x^2 + bx + c = (x + \frac{b}{2})^2 - \frac{b^2}{4} + c \).

Exponent rules:
- \( a^m \cdot a^n = a^{m+n} \)
- \( \frac{a^m}{a^n} = a^{m-n} \)
- \( (a^m)^n = a^{mn} \)
- \( a^{\frac{m}{n}} = \sqrt[n]{a^m} \)

Geometry
Circle: circumference = \( 2\pi r \), area = \( \pi r^2 \).

Ellipse: area = \( \pi ab \), where \( 2a \) and \( 2b \) are the lengths of the axes of the ellipse.

Sphere: vol = \( 4\pi r^3 \), surface area = \( 4\pi r^2 \).
Cylinder: vol = \( \pi r^2h \), lateral area = \( 2\pi rh \), total surface area = \( \pi r^2 + 2\pi rh + 2\pi r^2 \).

Analytic geometry
- Point-slope formula for straight line through the point \((x_0, y_0)\) with slope \(m\): \( y - y_0 = m(x - x_0) \).
- Circle with radius \( r \) centered at \((h, k)\): \((x - h)^2 + (y - k)^2 = r^2\).
- Ellipse with axes on the \(x\)-axis and \(y\)-axis: \( \frac{x^2}{a^2} + \frac{y^2}{b^2} = 1 \).

Trigonometry
- \( \sin(\theta) = \) opposite/hypotenuse
- \( \cos(\theta) = \) adjacent/hypotenuse
- \( \tan(\theta) = \) opposite/adjacent
- \( \sec(\theta) = 1/\cos(\theta) \)
- \( \csc(\theta) = 1/\sin(\theta) \)
- \( \cot(\theta) = 1/\tan(\theta) \)
- \( \sin(\theta) = \sin(\pi - \theta) \)
- \( \sin(\theta + \pi) = -\sin(\theta) \)
- \( \cos(\theta + \pi) = -\cos(\theta) \)

Law of cosines: \( a^2 = b^2 + c^2 - 2bc \cos A \)

Law of sines: \( \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \)

Sine of sum of angles: \( \sin(x + y) = \sin x \cos y + \cos x \sin y \)