INTERACTIVE POSTERS

ABSTRACTS

6.1 Varignon's theorem - Sandra Ollerhead, Mansfield High School, MA

Abstract: This activity explores Varignon's Theorem which states, "The midpoints of the sides of an arbitrary quadrangle form a parallelogram." It should be used after the students have learned the properties of quadrilaterals. As students answer each question they will be required to think about which properties are enough to guarantee that a quadrilateral is a parallelogram, rectangle, rhombus, or square.

6.2 The Ferris Wheel - Rasha Tarek, Greenwich HS, CT

Abstract: As you sit on a Ferris wheel your position varies sinusoidallly with respect to time. Your position can be traced using a set of parametric equations. In this animation you see yourself on the wheel and as the wheel turns two sinusoidal graphs are formed; one graph represents your horizontal distance from the origin, and another curve represents your vertical distance from the origin.

6.3 Reimann's Sums - Rasha Tarek, Greenwich HS, CT

Abstract: We use Reimann's sums to estimate the area under a given curve using rectangles. Depending on the concavity of the curve and the type of Reimann's sum used we may end up with an underestimate or an overestimate. This animation displays both the Left Reimann approximation and the Right Reimann approximation. The total area from each sum is displayed as is the difference between the two. As we increase the number of rectangles that error is diminished and the limit of the sum approaches the actual area under the curve.

6.4 The Ambiguous Case - Rasha Tarek, Greenwich HS, CT

Abstract: When solving a triangle using the law of sines we sometimes run into some ambiguity. This happens when we are given the lengths of two sides and the measure of a non-included angle. When solving such triangles the number of the solutions depends on the length of the height constructed across from the given angle. This animation shows the different cases of the ambiguous case; one triangle, two triangles, or no triangles.

6.5 Exploring the laws of Sines and Cosines in a Pre-Calc class - Dr. Jason Hardin, Worcester State University, MA

Abstract: The laws of sines and cosines are important topics in trigonometry, allowing one to solve non-right triangles given a side length along with two additional pieces of data (lengths of remaining sides, angle measures). These identities are usually presented as formulas for students to memorize. In this "poster" we look at an exploratory activity

in which students use GeoGebra to create triangles of various shapes and sizes, and then use the side lengths and angle measures to verify the laws of sines and cosines for the triangles they've created. This activity uses a simple GeoGebra applet which was easy to create and which students found enjoyable and enlightening.

6.6 Completing the squares - Brian Darrow, Jr., Southern Connecticut State University, CT

Abstract: Students are generally taught the process of completing the square in a very procedural manner where the reasons for, and the linkages between, each step are often not made clear. Observing the process visually (geometrically) might offer another perspective to the students who merely memorize the procedure without fully understanding why it works or how the process results in the answer. This poster presentation will explore the geometric analog to the algebraic process of completing the square through the actual "completion" of a two-dimensional square in the plane.

6.7 Taylor Polynomial Exploration - Dr. Leon Brin, SCSU/GISCT, CT

Abstract: Users will generate Taylor polynomials and their graphs with this worksheet. The degree of the polynomial is set using a slider. The center of expansion is set by dragging a point along the x-axis. The function to approximate is entered in a text box. The Taylor polynomial and its graph are displayed dynamically as changes are made.

6.8 Sierpinski's Gasket - Dr. Leon Brin, SCSU/GISCT, CT

Abstract: Sierpinski's triangle is a commonly depicted fractal. This worksheet generates an approximation one point or many points at a time using the random iteration algorithm. A point is given inside the triangle. A new point is created midway between the given point and a randomly selected triangle vertex. The next point is created midway between this new point and another randomly selected vertex. Successive points are created likewise. Using buttons to control the procession of the random iteration algorithm, the user can see Sierpinski's Triangle develop at whatever rate suits their fancy.

6.9 Level curves - Dr. Braxton Carrigan, SCSU/GISCT, CT

Abstract: In multivariate calculus, it is important for students to develop a good grasp of level curves before developing needed skills such as integration by slicing, gradient vectors, etc. This worksheet allows us to interact with the surface, graphed in the 3-D graphics window, simultaneously with its level curves, graphed in the 2-D graphics window. The user is asked to enter any two-variable polynomial, then uses a slider to vary a plane horizontal to the xy-plane. Simultaneously the level curve that is the intersection of the curve and the plane is graphed in the 2-D graphics window.

6.10 Special lines in a triangle - Dr. Marie Nabbout, SCSU/GISCT, CT

Abstract: The worksheet allows students to learn about the special lines in a triangle (medians, heights, bisectors, perpendicular bisectors). Students make conjectures about the location of the intersection points and study the cases of isosceles and equilateral triangles. They also learn about Euler's line.

6.11 Pythagorean Identities - Albert Navetta, Univ. New Haven, CT

Abstract: The worksheet provides a graphical approach to learning and discovering Pythagorean identities of trigonometric functions. Starting by identifying right triangles associated with the 3 familiar identities, we then identify other right triangles and find more Pythagorean identities. With a couple of examples, we then demonstrate how to construct new right triangles to find limitless Pythagorean identities. Along the way we discover geometric meanings for several less familiar trigonometric functions.

6.12 Shikaku Puzzle - Alex Briasco Brin, Freeport Middle School, ME

Abstract: The challenge is to completely cover a 10 by 10 grid with exactly 13 of the given colored rectangles without overlap. The user will simply drag and drop the rectangles into place. The catch is each rectangle must contain exactly one number, and that number must represent the rectangle's area.

6.13 How Fast Are You Spinning? - Tim Brzezinski, Berlin High School, CT

Abstract: The following applet allows students to see the circumference of the circle of latitude that he/she rotates around in one day. Our linear speed depends upon our latitude. In this applet, students use a slider to enter their latitude to the nearest tenth of a degree. Students are then asked to solve for one's linear speed at the equator and then solve for one's linear speed at his/her location on Earth. Any student with a solid knowledge of right-triangle trigonometry should be able to easily solve for his/her linear speed from the visual provide by the applet. After a student answers each of these 2 questions, a checkbox is provided for him/her to check his/her solution. The key introduction is contained in the worksheet & leading questions for students are provided in the applet itself.

6.14 Exterior Angles of Polygons: Proof Without Words - Tim Brzezinski, Berlin High School, CT

Abstract: This applet allows students to easily discover that the sum of the measures of the exterior angles of any convex polygon (with $n = 3, 4, 5, 6, 7,$ or 8), is always $360°$. This applet can be used by teachers to either (a) have students quickly and informally discover this theorem during class or (b) have students who may have forgotten this theorem after learning it re-experience meaningful remediation. Key leading questions are provided in the worksheet.