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| **Chapter 5 Review**  Section 5.1 Extra Practice  **1.** **a)** Sketch the graph of *y* = sin θ for −360° ≤ θ ≤ 360°. Identify the key points by labelling their coordinates on the graph.  **b)** What is the exact value of this function at 225°?  **c)** What are the *x*-intercepts of the graph?  **2.** **a)** Sketch the graph of *y* = cos *x* for 0 ≤ *x* ≤ 2π.  **b)** What is the exact value of this function at ?  **c)** What is the minimum value of this function?  **d)** What is the *y*-intercept of this function?  **3.** **a)** Sketch the graph of *y* = 4 sin *x* for *x* ∈ R.  **b)** State the range of the function.  **c)** What is the period of the function in radians?  **d)** State the amplitude.  **4.** **a)** Sketch the graph of  for θ ∈ R.  **b)** State the coordinates of the *y*-intercept.  **c)** State the range of the function.  **d)** State the amplitude.  **5.** **a)** Sketch the graph of *y* = sin 3*x* for 0° ≤ *x* ≤ 360°. Clearly plot the key points.  **b)** What is the period of the function, in degrees?  **c)** What is the range of this function?  **d)** State the amplitude.  **6.** **a)** Sketch the graph of  in radians. Show one complete cycle.  **b)** State the coordinates of the *y*-intercept.  **c)** What is the period of this function?  **d)** State the amplitude.  **7.** For each function, state the amplitude. Then, state the period in degrees and radians.  **a)** *y* = 4 sin 2*x* **b)**  **c)**  **d)**  **8.** Describe how each function’s graph is related to the graph of *y* = cos *x.*  **a)** *y*  2 cos 4*x* **b)**  **c)**  **d)** *y* = 5 cos (−*x*)  **6.** Consider the graph of *y*  3 cos 2*x*.  Write the equation of this graph as a sine function that has undergone a phase shift left.  **7.** For the given graph, determine  **a)** the amplitude **b)** the vertical displacement  **c)** the period  **d)** its equation in the form *y*  *a* cos *b*(*x*  *c*) + *d*  **e)** the maximum value of *y*, and the values of *x* for which it occurs over the interval 0 ≤ *x* ≤ 2π  **f )** the minimum value of *y*, and the values of *x* for which it occurs over the interval 0 ≤ *x* ≤ 2π  **8.** Determine an equation of the sine curve with a minimum point at (90°, 4) and its nearest maximum to the right at (120°, 10).  Section 5.3 Extra Practice  **1.** Let *y*  tan θ for 0  θ  2π. State the values for θ when  **a)** *y*  0 **b)** *y*  1 **c)** *y*  1 **d)** *y* is undefined  2. For *y*  tan *x*, state the exact value of *y* for each.  **a)** *x*  30° **b)** *x*  45° **c)** *x*  60°  **d)** *x*  90° **e)** *x*  120° **f )** *x*  135°  **g)** *x*  150° **h)** *x*  180°  3. **a)** Graph *y*  tan *x* for 0°  *x*  360°.  **b)** State the domain. **c)**State the range.  **d)** State the period.  Section 5.4 Extra Practice  **1.** The partial graphs of the functions *y* = 4sin 2(*x* + 45°) and the line *y* = 3 are shown. Determine the solutions to the equation 4sin 2(*x* + 45°) = 3 over the interval 0° ≤ *x* ≤ 360°. Express your answers to the nearest degree.  2. For each situation, state a possible domain and range. & the period of each function to the nearest tenth of a unit.  **a)** The motion of a point on an industrial flywheel can be described by the formula *h*(*t*)  where *h* is height, in metres, and *t* is the time, in seconds.  **b)** The fox population in a particular region can be modelled by the equation *F* (*t*)  where *F* is the fox population and *t* is the time,  in months.  3. In a 365-day year, a sinusoidal equation of the form *f* (*x*)  *a* cos *b*(*x*  *c*)  *d* can be used to graphically model the time of sunrise or sunset throughout the year, where *f* (*x*) is the time of the day in decimal time format, and *x* is the day of the year. The sunrise and sunset times for Yellowknife are provided in the table.   |  |  |  | | --- | --- | --- | |  | **June 21**  **(172nd day of the year)** | **Dec 21**  **(355th day of the year)** | | **Sunrise** | 2:34 a.m. | 10:11 a.m. | | **Sunset** | 10:45 p.m. | 3:00 p.m. |  1. Write an equation that models the time of sunrise in Yellowknife.   **b)**Write an equation that models the time of sunset in Yellowknife.  **4.** At the bottom of its rotation, the tip of the blade on a windmill is 8 m above the ground. At the top of its rotation, the blade tip is 22 m above the ground. The blade rotates once every 5 s.  **a)**Draw one complete cycle of this scenario.  **b)**A bug is perched on the tip of the blade when the tip is at its lowest point. Determine the cosine equation of the graph for the bug’s height over time.  **c)** What is the bug’s height after 4 s?  **d) H**ow long is the bug more than 17m above ground?  **8.** **a)** vert. exp. by a factor of 2, hor. compression by a factor of  **b)** vert. refl. over the *x*-axis, horizontal expansion by a factor of 5  **c)** vertical reflection over the *x*-axis, vertical expansion by a factor of 3, horizontal compression by a factor of  **d)** vert. exp. by a factor of 5, horizontal reflection over the *y-*axis  **9. a)** amp  per   or 60°  **b)** amp  2, per   or 270°  Section 5.2 Extra Practice  **1.** **a) b)**  **c)** **d)**  **2.** **a)** phase shift  25, vertical displacement  3.2  **b)** phase shift  vertical displacement  7  **c)** phase shift   vertical displacement  5  **d)** phase shift  vertical displacement  1  **3. a)** period  180°, range  { *y*  10  *y*  2, *y*  R}  **b)** period  6π, range  { *y*  1  *y*  5, *y*  R}  **c)** period  72°, range  { *y*  1.9  *y*  6.5, *y*  R}  **d)** period   range  { *y*  10  *y*  4, *y*  R}  **4.** period  range  { *y* *d*  |*a*|  *y*  *d*  |*a*|, *y*  R}  **5.** **a)** **b)**  **c)**  **d)**  **6.** Example:  **7.** **a)** 5 **b)** 4 **c)**  **d)** *y*  5 cos 3*x*  4  **e)** *y*  1 for *x*  0, 2**f )** *y*  9 for *x*   ,  **8.** Example: *y*  3 sin 6(*x*  105°)  7  **Section 5.3 Extra Practice**  **1.** **a)**   0,   ,   2**b)**  **c)**   **d)**  **2.** **a)** **b)** 1 **c)** **d)** undefined **e)****f )** 1 **g)**  **h)** 0 | **9.** Determine the amplitude & period for the graphs below.  **a)**  **b)**  Section 5.2 Extra Practice  **1.** Graph each pair of functions on the same grid. For each, clearly plot the key points.  **a)** *y*  2 sin *x* and *y*  2 sin (*x*  45°)  3  **b)** *y*  cos 3*x* and  **c)**  and  **d)** *y*  3 cos *x* and *y*  3 cos (*x*  60°)  4  **2.** For each function, determine the phase shift and vertical displacement with respect to *y*  cos *x*.  **a)** *y*  0.15 cos 2(*x*  25°)  3.2  **b)**  **c)**  **d)** *y*  6 cos (3*x*  2π)  1  **3.** Determine the period and range for each function.  **a)** *y* = 4 sin 2(*x* + 30°) – 6 **b)**  **c)** *y* = 2.3 sin (5*x* – 30°) + 4.2 **d)**  **4.** Determine the period & range of *y*  *a* cos *b*(*x*  *c*)  *d*.  **5.** Given the following characteristics, write each equation in the form *y*  *a* sin *b*(*x*  *c*)  *d*.  **a)** phase shift of  period of  vertical displacement of 5, and amplitude of 3  **b)** period of 120°, phase shift of 50°, amplitude of  and vertical displacement of 4  **c)** period of 8π and phase shift of  **d)** period of 3π and vertical displacement of 2  **4.** **a)**Graph *y*  tan *x* for π  *x*  π.  **b)**State the coordinates of the *x*-intercepts.  **c)**State the equations of the asymptotes.  **d)** What is the *y*-intercept?  **5.** Does *y*  tan *x* have an amplitude? Explain.  **6.** State the asymptotes and domain of *y*  tan *x*, in degrees.  **7.** A small plane is flying at a constant altitude of 3000 m directly toward an observer. Assume the land in the area close to the observer is flat.  **a)** Draw a diagram to model the situation. Label the horizontal distance between the plane & the observer *d*, & the angle of elevation from the observer to the plane θ.  **b)**Write an equation that relates the distance to the angle of elevation.  **c)** At what angle is the plane directly above the observer? What is the distance, *d*, when the plane is directly above the observer?  **8.** Consider the graph.  **a)** State the zeros of this function.  **b)**Where do the asymptotes of the function occur?  **c)** What is the domain of this function?  **d)** What is the range of this function?  **9.** Use the graph of the function *y*  tan θ  to determine each value.  **a)** tan π **b)** **c)**  **d)**  5. The average daily maximum temperature in Edmonton follows a sinusoidal pattern over the course of a year (365 days). Edmonton’s highest temperature occurs on the 201st day of the year (July 20th) with an average high of 24 °C. Its coldest average temperature is 16 °C, occurring on January 14.  **a)** Write a cosine equation for Edmonton’s temperature over the course of the year.  **b)** What is the expected average temperature for August 4th?  **c)** For how many days is the average temperature higher than 20 °C?  6. The pendulum of a grandfather clock swings with a periodic motion that can be represented by a trigonometric function. At rest, the pendulum is 16 cm above the base. The highest point of the swing is 20 cm above the base, and it takes 2 s for the pendulum to swing back and forth once. Assume that the pendulum is released from its highest point.  **a)** Write a cosine equation that models the height of the pendulum as a function of time.  **b)**Write a sine equation that models the height of the pendulum as a function of time.  **Answers Section 5.1 Extra Practice**  **1.** **a)** **2.** **a)**  **b)**   **b)** **c)** *y*  1 **d)** (0, 1)  **c)** (360, 0), (180, 0), (0, 0), (180, 0), (360, 0)  **3.** **a) 4a)**  **b)** (0, ) **c)** { *y* |   *y* ≤  *y*R}  **b)** { *y* | 4  *y*  4, *y*  R} **c)** 2 **d)** 4 **d)**  **5.** **a) 6. a)**  **b)** 120° **c)** { *y* | 1  *y*  1, *y*  R} **d)** 1  **b)** (0, 1) **c)** 4**d)** 1  **7.** **a)** amp  4, per  180° or **b)** amp  3, per 1800° or 10  **c)** amp   per  540° or 3**d)** amp   per  120° or  **3.** **a)** **b)** { *x* | 0°  *x*  360°, *x*  R, *x* ≠ 90°  or 270°}  **c)** { *y* | *y*  R} **d)** 180°  **4.** **a)** **b)** (, 0), (0, 0), (, 0)  **c)** **d)** 0  **5.** No, because it does not have  maximum and minimum values.  **6.** asymptotes: *x*  90°  180°*n*, *n*  I;   domain: {*x* | *x* ≠ 90°  180°*n*, *x*R, *n*I}  **7. a)**  **7b)** **c)** θ  90°, *d*  0 **8.** **a)** *x*  *n*π, *n*I **b)** at *n*I  **c)** {*x* |  *x*  R, *n*  I} **d)** { *y* | *y*  R}  **9.** **a)** 0 **b)** 1 **c)** 1 **d)** undefined  **Section 5.4 Extra Practice**  **1.** *x* = 21°, 159°, 201°, and 339°  **2.** **a)** domain: {*t* | *t* ≥ 0, *t*R} range: {*h* | 2  *h*  28, *h*R} period: 0.7m **b)** domain: {*t* | *t* ≥ 0, *t*R} range: {*F* | 500  *F*  1500, *F*R}  period: 24 foxes  **3. a)** *T*(*x*) = 3.808 cos  (*x* + 10) + 6.375  **b)** *T*(*x*) = − 3.875 cos  (*x* + 10) + 18.875  **4.** **a)** **b)** *b*(*t*)  − 7  **c)** *b*(4)  12.8 m  **d)** 3.52  1.48  2.04 s  **5. a)** *T*(*d* ) = 20 cos  (*d* − 201) + 4  **b)** 23.3 °C **c)** 76 days  **6. a)** *h*(*t*)  2 cos *t*  18  **b)** *h*(*t*)  2 sin (*t*  1.5)  18 or *h*(*t*)  2 sin (*t*  0.5)  18 |