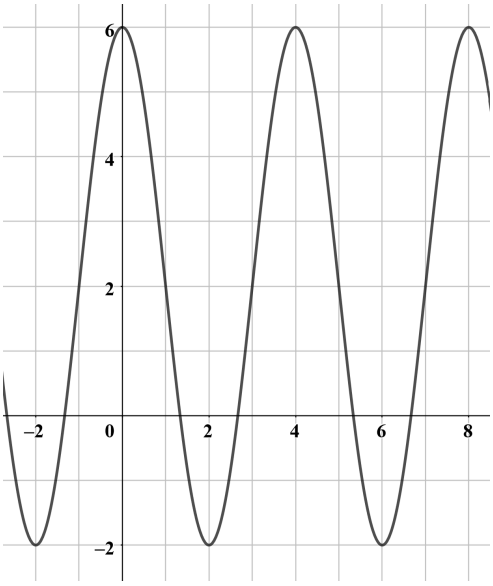
PRACTICE PROBLEMS – MATH 6B

Question 1 Let $h(\theta)$ be depicted in this graph. Assume θ is in radians.



(a). Determine each of the following for $h(\theta)$.

The midline is: _____

The period is: _____

The amplitude is: _____

(b). Write an equation for $h(\theta)$.

$h(\theta) =$_____

(c). Let $g(\theta) = \sin(3\theta) + 5$ for θ in **radians**. What is the period of g? **Include units.**

(d). Let $k(\theta) = 4\tan(\theta + 2)$ for θ in **radians**. What is the period of k? **Include units.**

(e). Let $n(x) = 3\cos\left(\frac{x}{2}\right) + 2$ for x in degrees. Answer the following questions.

$n(0^\circ) =$ _____

$n(180^\circ) =$ _____

The period of $n(x)$ is: _____

The minimum of $n(x)$ is: _____

Question 2 Ariya is on the edge of a cliff looking at the sea 200 ft below. She sees a ship approaching at an angle of depression *(angle at which observer looks down from horizontal)* of 30°.

(a). Draw a picture and label it carefully. Mark ALL important features. Include all quantities given in the problem as well as what each part represents (eg ship, ...).

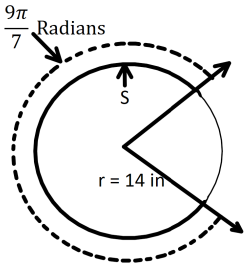
(b). How many feet out at sea (so away from the base of the cliff) is the ship?
Show your work and include units. *You do not need to evaluate your answer.*

(c). In 2 minutes the ship is at an angle of depression of 15°. Is the ship closer or further away? Justify with a picture.

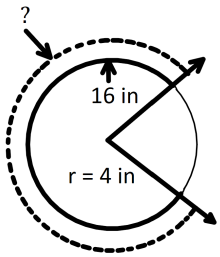
(d). Assume the ship is traveling at a constant speed. How fast is the ship traveling? **Include units.** *You do not need to evaluate your answer.*

Question 3 The following questions refer to these pictures. **Pictures may not be to scale.**

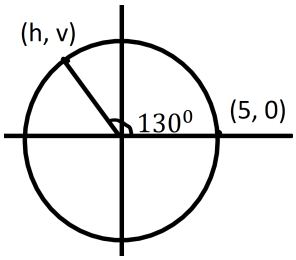
(i).



(ii).



(iii).



(a). In (i), convert the angle depicted with arc length S into Degrees. Show your work. **Include units.**

(b). In (i), how long is the arc length, S? **Include units.**

(c). In (ii), what is the angle depicted? **Include units.**

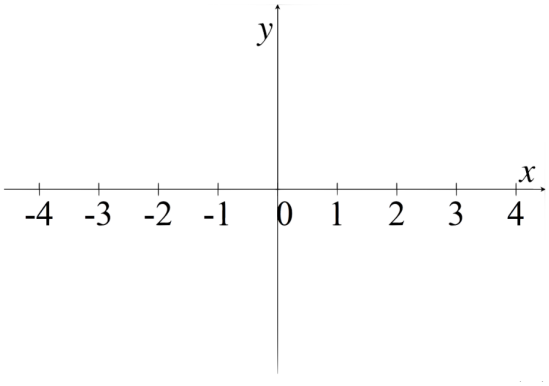
(d). In (ii), given your previous answer, is the picture an accurate representation of the actual angle? Justify.

(e). In (iii), what are the coordinates of the point (h, v)? Be precise. You do not need to evaluate.

$(h, v) = (\_\_\_\_\_ \quad , \quad \_\_\_\_\_)$

Question 4 Let $h(\theta) = \cos(\theta)$. Assume all angles are in radians.

(a). Graph $h(\theta)$. Label key features like max/min and period. Mark at least 2 angles.



(b). What is the largest domain (that includes 0 and at least some positive numbers) on which $h(\theta)$ has an inverse function, $h^{-1}(\theta)$? **Justify completely.**

(c). $h^{-1}(\theta) = \arccos(\theta)$ has: domain _____

range _____

(d). If possible, evaluate the following. If not possible, write DNE. Put your answers on the lines provided. *Hint: It may help to draw a unit circle and mark angles on it.*

(i). $\arccos(\cos(\frac{\pi}{2})) =$_____

(ii). $\arccos(\cos(2\pi)) =$_____

(iii). $\cos(\arccos(\frac{\sqrt{3}}{2})) =$ _____

(iv). $\cos(\arccos(\pi)) =$ _____

Question 5 Let $f(x) = -(x+2)(x-3)^2(x+5)$.

(a). What are the zeros of $f(x)$ and is the degree of each zero of $f(x)$ even or odd? **List them in increasing order and checkmark to show if the zero is even or odd.** *Note that there may be more blanks than necessary.*

(i). The zero at $x =$_____ has ◯ even ◯ odd degree

(ii). The zero at $x =$_____ has ◯ even ◯ odd degree

(iii). The zero at $x =$_____ has ◯ even ◯ odd degree

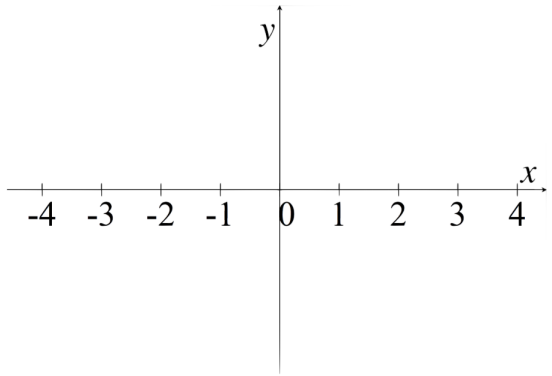
(b). Where is $f(x)$ continuous?

(c). What is the leading term of $f(x)$?

(d). Evaluate the following limits.

$\lim_{x\to-\infty} f(x) =$_____ $\lim_{x\to\infty} f(x) =$_____ $\lim_{x\to 0} f(x) =$_____

(e). Sketch $y = f(x)$. **Label the coordinates, (x, y), of all zeros and the y-intercept.**



(f). How would the graph of $g(x) = 3(x+2)(x-3)^2(x+5)$ compare to the graph of $f(x)$? Be specific.

Question 6 Let $g(x) = \dfrac{7(x+1)^2(x+4)(x+3)^2}{9(x+1)(x-3)^2(x-4)(x-5)}$.

****JUSTIFY ALL** of your answers and WRITE THEM WITH PROPER NOTATION.****

(a). What is the domain of $g(x)$?

(b). What are the zeros of $g(x)$?

(c). What are the vertical asymptotes, if any, of $g(x)$?

(d). What are the holes, if any, of $g(x)$?

(e). What are the horizontal asymptotes, if any, of $g(x)$? **Justify completely.**

(f). Evaluate $\lim_{x \to -1} g(x)$. Does this equal $g(-1)$? **Justify.**

Question 7 True or false: the following is an identity. **JUSTIFY** your answers. Assume angles are in radians. If you use a well-known identity, include its name. NOTE: You may only reference identities used *by name* in class.

(a). $\sin(\theta) + \cos(\theta) = 1$ ◯ True ◯ False

(b). $\tan(\theta + \pi) = \tan(\theta)$ ◯ True ◯ False

(c). $\sin(2\theta) = 2\sin(\theta)$ ◯ True ◯ False

(d). $\cos(\theta + \pi) = -\cos(\theta)$ ◯ True ◯ False

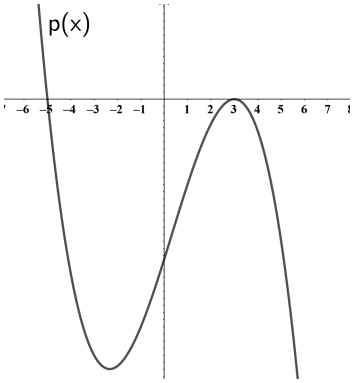
(e). $1 = \sec^2\theta - \tan^2\theta$ ◯ True ◯ False

Question 8 Read the question and all answers carefully, before selecting your answer and choose the *best* answer.

(1). Let $f(x) = 3x^2$. Suppose $a(x) = -f(x) + 5$. What does $a(2)$ equal?

(A). -7 (B). -1 (C). 1 (D). 11 (E). 17

(2). Equation of the rational function $p(x)$ equals:

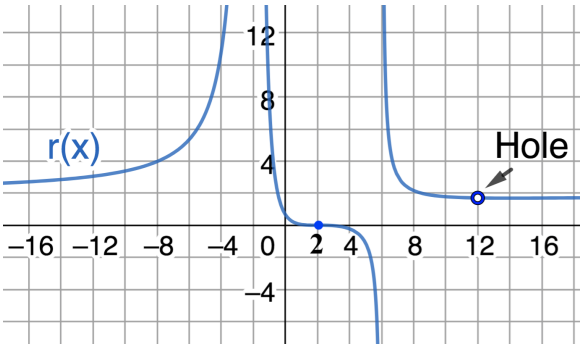


(A). $-(x+5)(x-3)^2$
(B). $7(x+5)(x-3)^2$
(C). $(x-5)(x+3)$
(D). $-(x-5)(x+3)^2$
(E). $(x-5)^2(x+3)$

(3). How many times does the graph of $f(x) = 5(x-4)^3(x+3)^2(x^2+9)$ CROSS the x-axis?

(A). 0 (B). 1 (C). 2 (D). 3 (E). 6

(4). Equation of the rational function $r(x)$ equals:



(A). $\dfrac{2(x-2)^2(x-12)}{(x+2)^2(x-6)(x-12)}$
(B). $\dfrac{2(x-2)^2(x-12)}{(x+2)(x-6)^2}$
(C). $\dfrac{2(x-2)(x-12)}{(x+2)(x-6)(x-12)}$
(D). $\dfrac{2(x-2)^3(x-12)}{(x+2)^2(x-6)(x-12)}$
(E). $\dfrac{2(x-2)^2(x-3)}{(x+2)(x-6)(x-12)}$

(5). Let $C(x) = \dfrac{4(x+6)(x+2)(x-4)^2}{7(x+6)(x+2)^2(x-5)}$. The vertical asymptotes of f are at x equals:

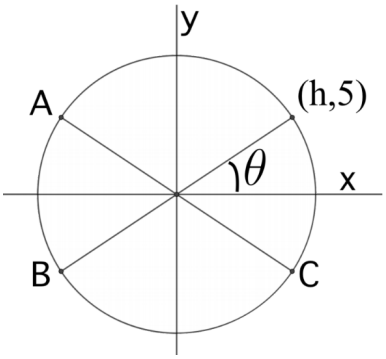
(A). $-6, -2, 4, 5$ (B). $-6, -2, 3$ (C). $-6, 5$ (D). $-6, -2, 4$ (E). $-2, 5$

(6). Let $f(x) = -\dfrac{1}{x^3}$. Then $\lim_{x \to 0} f(x) =$

(A). $-\infty$ (B). 0 (C). ∞ (D). DNE (E). None of these

(7). The angle from the positive x-axis counter-clockwise to A is:

(A). $\theta - \pi$ (B). $\pi - \theta$ (C). $\pi + \theta$ (D). $2\pi - \theta$ (E). None of these



(8). The coordinates of C are:

(A). $(h, -5)$ (B). $(-h, 5)$ (C). $(5, h)$ (D). $(h\cos(\theta), 5\sin(\theta))$ (E). $(h\sin(\theta), 5\cos(\theta))$

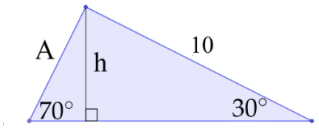
(9). Select the best answer. The slope of the line through B and the origin is:

(A). $\dfrac{5}{h}$ (B). $\dfrac{h}{5}$ (C). $\tan(\theta)$ (D). (A) & (C) (E). (B) & (C)

(10). Consider a person standing 16 feet from a light pole. The individual notices that the light casts a shadow of his body that is 4 feet long. If the individual is 6 feet tall, how tall (in feet) is the light pole?

(A). 30 (B). $\sqrt{16^2 - 6^2}$ (C). $\sqrt{16^2 + 6^2}$ (D). 20 (E). None of these

(11). What is the measure of the unlabeled angle between sides of length h and 10?



(A). $80°$ (B). $20°$ (C). $60°$ (D). $180°$ (E). None of these

(12). In the triangle pictured above, what is the length of h?

(A). $10\sin(30°)$ (B). $10\cos(30°)$ (C). $\dfrac{\cos(30°)}{10}$ (D). $\dfrac{10}{\sin(30°)}$ (E). None of these

(13). In the triangle pictured above, what is the length of A?

(A). $\dfrac{10\sin(30°)}{\sin(70°)}$ (B). $\dfrac{\sin(30°)}{10\sin(70°)}$ (C). $\dfrac{10\sin(70°)}{\sin(30°)}$ (D). $\dfrac{10\cos(70°)}{\cos(30°)}$ (E). None of these

(14). If $\sin(\theta) = -0.4$ and θ is in quadrant III, then $\cos(\theta)$ equals

(A). 0.6 (B). -0.6 (C). $\sqrt{1-0.4^2}$ (D). $-\sqrt{1-0.4^2}$ (E). $-\sqrt{1+0.4^2}$

(15). The number of solutions to the equation $\cos(\theta) = 1.5$ is:

(A). 0 (B). 1 (C). 2 (D). infinite (E). None of these