Circuit Training – Factoring (Mixed, Intermediate) **Name** _____

Directions: Begin in cell #1. Factor the expression, then search for *one* of your factors. When you find it, call that problem #2 and continue in this manner until you complete the circuit. You may need to attach additional sheets of paper to showcase your best work.

Answer: _____ # __1__ Factor the GCF: $24a^2b^3 - 56ab^2$	Answer: 2 # _____ If $m = -8$, then there is a unique solution to the equation $x^2 + mx + 16 = 0$. What other value of m yields just one solution?
Answer: $a - 4$ # _____ Factor: $49a^2 + 25b^2$	Answer: $a - 5$ # _____ Factor: $49a^2 - 9b^2$
Answer: $a - 3$ # _____ Factor by grouping: $ab + 7b + 3a + 21$	Answer: $a^2 - 4a + 16$ # _____ The equation $s(t) = -5t^2 + 3t + 2$ gives the height, $s(t)$, in meters, of a diver at any time t, in seconds, where $t \geq 0$. When does the diver hit the water?
Answer: $4a - 5$ # _____ Use factoring to solve the equation $x^2 - 2x - 3 = 0$. What is the sum of the solutions?	Answer: $a^2 - 5a + 25$ # _____ Factor: $9a^2 - 25b^2$
Answer: $5(a - 1)$ # _____ Simplify: $\frac{a^2-9}{a^2+5a+6}$ for $a > -2$.	Answer: $a + 8$ # _____ Factor: $49a^2 - 14a + 1$
Answer: $3ab - 7$ # _____ Factor the trinomial $a^2 - 10a + 21$ so that it is the product of two binomials.	Answer: $a - 2$ # _____ Factor: $a^3 - 3a^2 + 5a - 15$

Answer: $2a-1$ # _____ Rewrite the trinomial $2a^2+13a+15$ as a product of two binomials.	Answer: $7a+2b$ # _____ Factor the difference of squares: a^2-25
Answer: $3a+5b$ # _____ Factor the difference of cubes: a^3b^3-125	Answer: 8 # _____ Factor: a^3+64
Answer: a^2 # _____ Factor: $a^2+16a+64$	Answer: a^2+5 # _____ Factor: $4a^2+7a-15$
Answer: 1 # _____ Factor completely: $2a^3+2a^2-40a$	Answer: $a+5$ # _____ The trinomial x^2-7x-8 can be written as the product of two binomials, $(x+a)(x+b)$. What is $a+b$?
Answer: $\frac{a-3}{a+2}$ # _____ Write a trinomial that has $(3a+17)$ as one of its two factors.	Answer: prime # _____ Use factoring to simplify the rational expression: $\frac{5a^2-5}{a+1}$ (note $a \neq -1$).
Answer: -7 # _____ Factor $21a^4b^2+6a^3b^3$	Answer: $ab-5$ # _____ Factor: $9a^2-25a^2b$
Answer: $7a-1$ # _____ Factor completely: a^4-8a^2+16	Answer: a^3+8 # _____ Factor the sum of cubes: a^3+125
Answer: $7a-3b$ # _10_ Multiply: $(a+2)(a^2-2a+4)$	Answer: $a+7$ # _____ Factor by grouping: $2a^2-14a-1a+7$

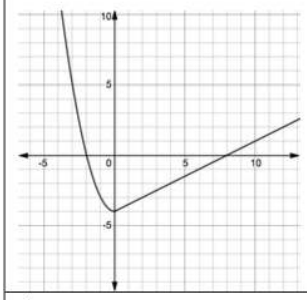
Circuit Training – Piecewise Functions (precalculus) **Name** _____

Directions: Begin in cell #1. Answer the question (show necessary work on this page or attach separate paper). Search for your answer. Call that cell #2 and proceed in this manner until you complete the circuit (get back to the beginning). No technology is needed!

# __1__ Answer: 5 $f(x) = \begin{cases} \lvert 2-x \rvert, & x \le 0 \\ 0.5x^2 - 5, & x > 0 \end{cases}$ $f(6) + f(-3)$	# _____ Answer: 9 $f(n) = \begin{cases} 3n+1, & \text{if } n \text{ is odd} \\ \frac{n}{2}, & \text{if } n \text{ is even} \end{cases}$ $f\left(f\left(f\left(f\left(f\left(f\left(f(42)\right)\right)\right)\right)\right)\right)$ Look up The Collatz Conjecture if this piques your interest!
# _____ Answer: 8 $f(x) = \begin{cases} -x^3 + 4, & x < -2 \\ -\frac{1}{2}x + 11, & x \ge -2 \end{cases}$ $f^{-1}(10)$	# _____ Answer: 13 Find the minimum value of the function $w(x)$. $w(x) = \begin{cases} x^2 + 4x + 1, & x \le -1 \\ x - 1, & x > -1 \end{cases}$
# _____ Answer: 18 $g(x) = \begin{cases} \frac{x}{2}, & x = -2 \\ 2^{x+3}, & x \ne -2 \end{cases}$ $g(-2) - g(0)$	# _____ Answer: 7 $w(x) = \begin{cases} x^2 + 4x + 1, & x \le -1 \\ x - 1, & x > -1 \end{cases}$ Is $w(x)$ continuous at $x = -1$? If yes, go to answer 10. If no, go to answer 5.
# _____ Answer: −16 Solve $f(x) = 5$. There are four solutions. Find the sum of the solutions. $f(x) = \begin{cases} -x^2 - 6x, & x < 1 \\ \frac{1}{2}x, & x > 1 \\ 5, & x = 1 \end{cases}$	# _____ Answer: 6 $g(x) = \begin{cases} \frac{x+3}{x+2}, & x \ne -2 \\ \frac{1}{4}, & x = -2 \end{cases}$ $g(0) + g(-2) + g(2)$

_____ Answer: -11

The graph shows the piecewise function $f(x) = \begin{cases} x^2 + b, x \le 0 \\ ax + c, x > 0 \end{cases}$. Evaluate $\frac{b+c}{a}$.



_____ Answer: -9

$$p(x) = \begin{cases} 9\sin x, & x < \frac{\pi}{2} \\ 2 + \cos x, & \frac{\pi}{2} \le x < \pi \\ \tan x, & x \ge \pi \end{cases}$$

$$\frac{p\left(\frac{2\pi}{3}\right) + p\left(\frac{\pi}{6}\right)}{p\left(\frac{5\pi}{4}\right)}$$

_____ Answer: -3

$$f(x) = \begin{cases} 5e^{x+3}, & x \le 0 \\ \ln x, & x > 0 \end{cases}$$

$$f(-3) + f(e^3)$$

_____ Answer: 12

$$w(x) = \begin{cases} \frac{|x-5|}{x-5}, & x \ne 5 \\ x^3 - 121, & x = 5 \end{cases}$$

$$w(2\pi) + w(5) + w(-e)$$

_____ Answer: 10

Find b so that $f(x)$ is a continuous function.

$$f(x) = \begin{cases} bx + 1, & x < 2 \\ \frac{5}{2}x - 6, & x \ge 2 \end{cases}$$

_____ Answer: 1

$$p(x) = \begin{cases} 5x - 3, & x < -2 \\ x^2 + 2x + 7, & -2 \le x < 2 \\ x^3 + 8, & x \ge 2 \end{cases}$$

What is the y-intercept of $p(x)$?

_____ Answer: 2

$$f(x) = \begin{cases} x - 5, & x < 0.5 \\ 3x + 1, & x \ge 0.5 \end{cases}$$

x	-7	-2	2	7
$g(x)$	0.5	-3	0	-6

$$g(f(2)) + f(g(2))$$

_____ Answer: -1

Find a so that $h(x)$ is a continuous function.

$$h(x) = \begin{cases} \frac{x^2 + 7x - 30}{x - 3}, & x \ne 3 \\ a, & x = 3 \end{cases}$$

_____ Answer: 3

$$w(t) = \begin{cases} 4t^2 + 1, & t < -1 \\ t + 3, & t \ge -1 \end{cases}$$

The equation $w(t) = 17$ has two real solutions. Find the sum of the solutions.

_____ Answer: 4

$$v(t) = \begin{cases} [\![t]\!], & t > 1 \\ |t - 3|, & t \le 1 \end{cases}$$

$$v(-2) + v(0) + v(1.42)$$

Circuit Training – Using Tables (pre-calculus) **Name**_____

Directions: The following table shows selected values of three continuous functions $f, g,$ and h. The function h is also strictly decreasing. Beginning in cell #1, use only the values in the table to evaluate the expressions or equations for the given x – value(s). Search for your answer. Call that cell #2 and proceed in this manner until you complete the circuit. For your convenience, the table is on both sides.

Table:

x	$f(x)$	$g(x)$	$h(x)$
0	– 2	3	4
1	3	$\sqrt{2}$	2
2	0	– 3	$\frac{3}{2}$
3	-1	$\frac{\pi}{4}$	0
4	6	$-\frac{4}{3}$	$-\frac{\pi}{2}$
5	7	– 3	– 3

Answer: $-\frac{\pi}{4}$

__1__ $g(5) \cdot h(2)$

Answer: $\frac{3}{2}$

_____ $3g(1) + 2\sin(g(3)) + \cos(h(4))$

Answer: 3

_____ For what value of x does $h(x) = g(x)$?

Answer: $-\frac{9}{2}$

_____ $g(0) - f(1)$

Answer: 4

_____ $\frac{g(3)}{g(4)}$

Answer: $-\frac{3\pi}{16}$

_____ Find $g(h^{-1}(0))$

Answer: $\frac{\pi+16}{4}$

_____ $\frac{f(4)}{h(0)}$

Table:

x	$f(x)$	$g(x)$	$h(x)$
0	– 2	3	4
1	3	$\sqrt{2}$	2
2	0	– 3	$\frac{3}{2}$
3	-1	$\frac{\pi}{4}$	0
4	6	$-\frac{4}{3}$	$-\frac{\pi}{2}$
5	7	– 3	– 3

Answer: $2-\sqrt{2}$

_____ Let $w(x) = e^{h(x)} + 5(f(x))^2$. Find $w(3)$.

Answer: $\frac{\pi}{4}$

_____ If $p(x) = \frac{g(x)+5}{f(x)-6}$, find $p(3)$.

Answer: 0

_____ $f(2) + g(3) + h(0)$

Answer: 5

_____ Let $h^{-1}(x)$ be defined as the inverse of $h(x)$. Find $h^{-1}(2)$.

Answer: 6

_____ Let $r(x) = \sqrt{7 - f(x)}$. Find $r(0)$.

Answer: $4\sqrt{2}$

_____ If $p(x) = h(x) - g(x)$, find $p(1)$.

Answer: $\frac{\pi+20}{-28}$

_____ Find the average rate of change of $h(x)$ on the closed interval $[0, 4]$.

Answer: $-\frac{\pi}{8} - 1$

_____ $\text{Arcsin}(f(3)) + \text{Arcsec}\,(g(1))$

Answer: 1

_____ For what $x-$value is $p(x) = \frac{g(x)+5}{f(x)-6}$ undefined?

Circuit Training – Precal / Trig Review **NO CALCULATOR!** ☺ Name _____

Directions: Beginning in cell #1, read the question and show the work necessary to answer it (attach separate sheets if necessary). Search for your answer and call that cell #2. Continue in this manner until you complete the circuit. Note: The last question will not have a match!

# 1 Find the slope of the line which connects the point (b, 3b) to the point (3b, 6b). [Note: b≠0.]	Answer: $\frac{-1+ln3}{2}$ # _____ The graph of y = 2 sin(3x - $\frac{\pi}{2}$) has an amplitude of _____, a period of _____, and a phase shift of _____ to the _____ (left/right) when compared to the graph of y = sinx.
Answer: $\frac{2e}{1-e}$ # _____ As x grows infinitely large, the value of $h(x) = \frac{2x}{5x+8}$ approaches what number?	Answer: 4/5 # _____ Find the average rate of change of $w(x) = 3x^2 + 1$ over the interval [-1, 4].
Answer: 75 # _____ For $\frac{\pi}{2} \leq A \leq \pi$, $sinA = \frac{3}{5}$. Find $\sin(2A)$.	Answer: 9 # _____ If $f(x) = lnx$ and $g(x) = e^{x+1}$, find $f(g(2)) - g(f(e))$.
Answer: 21 # _____ $f(x) = g^{-1}(x)$ and $g(x) = \frac{2x}{x-1}$; $f(5) = ?$	Answer: $(-\infty, 2) \cup (2, \infty)$ # _____ $log_{10}25 + log_{10}4 =$
Answer: [-2, 2] # _____ Solve for x: $e^{2x+1} - 3 = 0$	Answer: x = -3 # _____ State the domain of $y = \ln(x - 2)$.
Answer: 2/5 # _____ The expression $3x^2$ is used to calculate the slope at any point on the graph of the function g(x) = $x^3 - 1$. Write the equation of the line tangent to g(x) at its x-intercept.	Answer: 3/2 # _____ The linear function f(x) is parallel to the line $y = \frac{4}{5}x - 7$ and passes through the point (-5, 0). What is f(-6)?

Answer: -4/5 # _____ The quadratic function g(x) has a vertex at (-5, 0) and y-intercept of (0, -5). What is g(1)?	Answer: 2 # _____ The graph of $g(x) = -\sqrt{4-x^2}$ is a semicircle in quadrants III and IV. Find the domain of $g(x)$.
Answer: 4 # _____ Simplify the expression $\frac{x^3+125}{x+5}$ and then evaluate the resulting expression for x = -5.	Answer: 26 # _____ Find $x^2 - y^2$ given that x + y = 7 and x – y = 3.
Answer: $3 - e^2$ # _____ Given $f(x) = x^2 + 5$, find $\frac{f(3+h)-f(3)}{h}$ $(h \neq 0)$.	Answer: 36 # _____ State the range of $w(x) = \frac{2x+1}{x+3}$.
Answer: x > 2 # _____ $81^{\frac{3}{4}} + 8^{\frac{2}{3}} + 125^{\frac{1}{3}}$	Answer: -24/25 # _____ The graphs of $g(x) = \ln(x+3)$ and $f(x) = \frac{2x+1}{x+3}$ have the same vertical asymptote. What is it?
Answer: 5/3 # _____ Solve for x: $\ln(x) - \ln(x+2) = 1$	Answer: y = 3x – 3 # _____ Evaluate g(x) = 5sinx + cos(2x) for x = $\frac{\pi}{2}$.
Answer: -36/5 # _____ Find the average rate of change of the function $p(x) = \frac{4}{5}x - 2$ from x=0 to x=15.	Answer: 6 + h # _____ If the perimeter of a rectangle is 68 and the width is 10, find the length of a diagonal.

Circuit Training – Precalculus /Trig Review **CALCULATOR ACTIVE** Name _____

Beginning in cell #1, use a combination of analytic methods and a graphing calculator to solve the problem. Show how you arrived at your answer, even if a lot of your work was done on the calculator. Hunt for your answer and call this problem #2. Continue in this manner until you complete the circuit. Note: Answers are rounded or truncated to three decimal places. Also, make sure you know HOW to do these on the test when there are no answer choices!

Answer: 0.510 #1 Find the average rate of change for the function $f(x) = 3e^{-x}$ from $x = -1$ to $= 7$.	Answer: 1.771 # _____ The function $r(x) = \frac{x+2}{2x-3}$ has a horizontal asymptote of y = _____.
Answer: -1.750 # _____ Find $f(g\left(-\frac{4\pi}{7}\right))$ if $f(x) = \begin{cases} \lvert x\rvert - 2, & x \le 0 \\ \frac{3}{x}, & x > 0 \end{cases}$ and $g(x) = \tan x$.	Answer: 5.832 # _____ Find the zero of $f(x) = 3 - 2^x$.
Answer: 1.585 # _____ Suppose the number of cases of a rare disease is able to be reduced by 25% annually. If there are 4000 cases nationwide, how many years will it take to reduce the number of cases to 300 ?	Answer: 1.500 # _____ The graph of an exponential function, $y = a \cdot b^x$, passes through the points $(1, 1)$ and $(2, 3.5)$. Find the value of a.
Answer: 0.500 # _____ If $f(g(x)) = g(f(x)) = x$, and $g(x) = 2 + \ln(x + 1)$, find $f(4)$.	Answer: 9.899 # _____ A cone has a height which is one-sixth the radius. If the radius is two, what is the volume of the cone?
Answer: 1.396 # _____ $g(x) = \ln(x - 4)$ and $f(x) = \frac{1}{2}x^2 + 3$. Find $f(g(6))$.	Answer: 0.685 # _____ A drug is administered intravenously for eight hours, $0 \le t \le 8$, and the function $f(t) = 32 - 8.2\ln(1 + 2t)$ gives the number of units of the drug in the body after t hours. How many units are present after 7 hours (at time $t = 7$)?

Answer: 9.004 # _____ What is the period of $y = \sin(4x)$?	Answer: -1.019 # _____ For $g(x) = -3x^2 + 5.2x + 7$, find the maximum value of the function.
Answer: 1.760 # _____ Solve for θ, $\frac{3\pi}{2} \leq \theta \leq 2\pi$. $cos\theta = 0.9$	Answer: 0.456 # _____ What is the minimum value of $y = -3\cos t + 1.25$?
Answer: 9.794 # _____ The function $v(t) = -9.8t + 5$ gives the instantaneous velocity (in m/sec) of an object thrown upward with an initial velocity of 5 m/sec. At what time t does the object start falling?	Answer: 3.240 # _____ Solve the non-linear system $\begin{cases} y = \sqrt{x+2} \\ y = 1.1x^5 \end{cases}$. To advance in the circuit, locate the y-coordinate of the solution.
Answer: 9.253 # _____ An isosceles right triangle has a leg of 7 cm. What is the length of the hypotenuse, in cm?	Answer: 6.389 # _____ Solve $\sec(3x) = 5$ on the open interval $\left(0, \frac{\pi}{6}\right)$.
Answer: 0.286 # _____ $log_3 7$ = ?	Answer: 1.571 # _____ The function $f(x) = \frac{x+2}{2x-3}$ has a vertical asymptote at x = _____.