

Exam 1

Math 112, Winter '17, Wray

Name: _____

Student Number: _____

Don't leave anything blank.
I can sometimes give you partial credit.

Check your answers.
Also, check to see if you read the problem correctly.

Pace yourself.
Do the problems you know how to do, and save tricky ones for later.

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True/False (Decide whether each of the following statements is always true or sometimes false and then clearly mark with either T or F. [1 pt each])

1. ____ The graph of $g(x) = e^{2x}$ is a horizontal stretch graph of e^x by a factor of two.
2. ____ If $f(x)$ is periodic with midline $y = 3$, then $f(x) - 1$ has midline $y = 2$.
3. ____ $[\cos(6t + 1)]^2 + [\sin(6t + 1)]^2 = 1$, for any real number t .
4. ____ If $f(2) = -f(-2)$ and $f(3) = -f(-3)$, then f is an odd function.

Short Answer. Give a short explanation for each of the following questions. Use complete sentences. [3 pts each]

5. If $f(x)$ is periodic and there is at least one solution to $f(x) = 1$, then how many other solutions to $f(x) = 1$ are there?
6. Can $\sin(\theta)$ or $\cos(\theta)$ have outputs larger than 1?

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7. [5 pts] Let $g(x) = -2(\ln(4 - 2x) - 9)$. Identify the *simplest* possible parent function and list the transformations in the correct order.
8. [5 pts] Find the exact values of $\cos(-690^\circ)$ and $\sin(-690^\circ)$. Show all work. (An answer with no supported explanation will receive no credit.)

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9. [4 pts] The Earth is a distance of 1 AU (astronomical unit) from the Sun. When the planet Mercury (which is closer to the sun) forms a right angle with Earth and the Sun, it is at a distance of 0.5 AU from the Sun.

Mercury ● ● Sun

● Earth

What is the distance from Earth to Mercury in this moment? Include units.

10. [4 pts] Suppose you knew that $\sin(\theta) = \frac{\sqrt{6}}{7}$, and that $90^\circ \leq \theta \leq 270^\circ$. What is the value of $\cos(\theta)$?

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11. [2 pts each] Decide if the following functions are even, odd, or neither.

(a) $h(t) = \pi$

(b) $g(x) = x^2(1 + x)^3$

12. [4 pts] A ship is leaving Seattle and heading for Tokyo. The ship has planned to be $D(t)$ miles away from Seattle t hours after departure. In order to communicate with Tokyo, the ship's captain wants to specify their distance in kilometers. Furthermore, the captain also wants to let them know how many days it has been since they left. Let $K(d)$ be the ship's distance from Seattle that the Captain will report. How does the captain find $K(d)$ in terms of the function $D(t)$? That is, express $K(d)$ as a transformation of $D(t)$. [One mile is about 1.6 kilometers.]

13. [4 pts] A painter has a 4 meter long ladder. He wants the ladder to make a 45° angle with the ground. How high does the painter's ladder reach?

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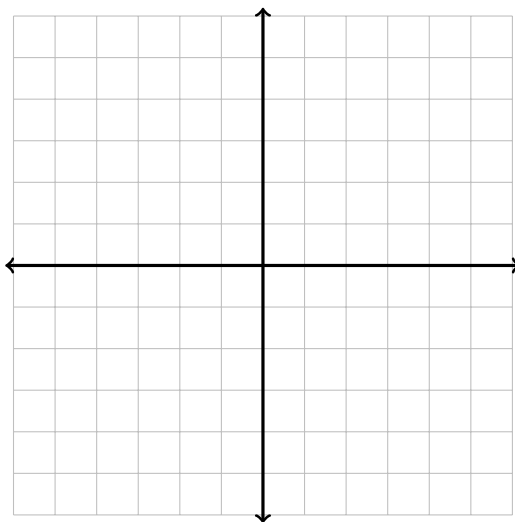
14. [4 pts] Let $f(x) = x^2 + 4x + 7$. Find a parent function $p(x)$ and express $f(x)$ as a transformation of $p(x)$.

15. [6 pts] Suppose a periodic function G with period 2 is defined by

$$G(t) = 2^t$$

for $-1 \leq x < 1$.

(a) Sketch a graph of G with at least three periods.



(b) Calculate $G(5)$.

(c) Find *all* solutions to the equation $G(t) = \frac{1}{2}$.