



MATH195 – Precalculus

Sample Final Exam B

First Name:

Last Name:

EMPLID:

Directions:

- **NO** notes, calculators, or other electronic devices allowed. *All electronic devices must be turned off and placed out of sight or they will be confiscated for the duration of the exam.*
- Read each problem carefully. Unless otherwise instructed, be sure to show your work.
- Remember that it is your **responsibility** to answer each question clearly and in a way that convinces the grader that you understand how to solve each problem.

- GOOD LUCK!

You can use this page as scrap. However any work done on this page will not be graded.

Answer all 21 questions. ***You must show all of your work*** as neatly and clearly as possible and indicate the final answer in the box for each **non-graph** question. For all **graph** questions, you should sketch your graph on the grid provided.

1. (8 points) Let $P(x) = x^3 + 2x^2 - 5x - 6$.

(a) (4 points) Use the Rational Zeros Theorem to find all real zeros of $P(x)$.

Show your work in the box below:



(b) (4 points) Using the result from part (a), factor $P(x)$ completely.

Write your answer in the box below:



2. (8 points) A stake is to be driven into the ground away from the base of a 50-foot pole. A wire from the stake on the ground to the top of the pole is to be installed at an angle of elevation of 60° .

(a) (4 points) At what distance from the base of the pole should the stake be placed?

Write your answer in the box below:

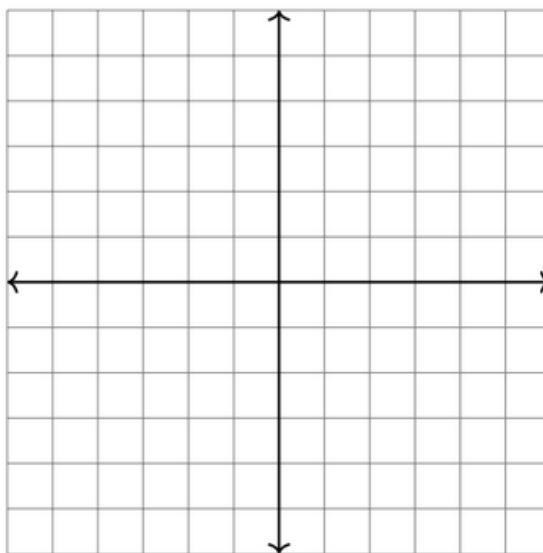
(b) (4 points) What will be the length of the wire from the stake to the top of the pole?

Write your answer in the box below:

3. (8 points) Consider the equation of the circle $x^2 + y^2 + 2x + 6y + 9 = 0$.
- (a) (4 points) Write the equation in standard form.

Write your answer in the box below:

- (b) (4 points) Graph the circle on the axes below. Label the center and radius.



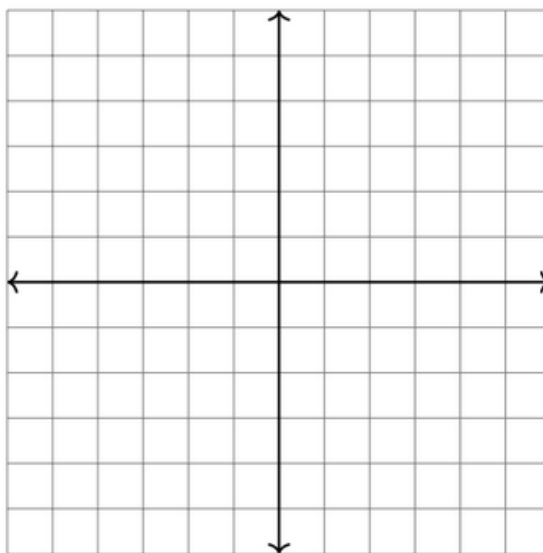
4. (8 points) Consider the system of nonlinear equations.

$$\begin{cases} 2x + y = 1 \\ y = 4 - x^2 \end{cases}$$

- (a) (4 points) Solve the system of equations. Write your answers in coordinate point form.

Write your answer in the box below:

- (b) (4 points) Graph the system on the axes below. Clearly label the solutions to the system.



5. (4 points) Evaluate and simplify $\csc \left[\sin^{-1} \left(\frac{1}{2} \right) + \cos^{-1} \left(\frac{1}{2} \right) \right]$.

Write your answer in the box below:

6. (4 points) Evaluate the difference quotient $\frac{f\left(\frac{\pi}{2} + h\right) - f\left(\frac{\pi}{2}\right)}{h}$ when $f(x) = \sin x$.

Write your answer in the box below:

$$\frac{f\left(\frac{\pi}{2} + h\right) - f\left(\frac{\pi}{2}\right)}{h} =$$

7. (4 points) Use algebra to determine if the function $f(x) = x + |x|$ is *even*, *odd*, or *neither*. Complete the statement in the box below. **No credit will be given unless all work is clearly shown.**

Write your answer in the box below:

The function is

8. (4 points) Suppose that $f(x)$ is a linear function. If $f(1) = 0$ and $f(2) = 3$, find an equation defining $f(x)$.

Write your answer in the box below:

$f(x) =$

9. (4 points) Solve the trigonometric equation $\sin 2\theta = \sin \theta$, for all values of θ on the interval $0 \leq \theta \leq 2\pi$.

Write your answer in the box below:

$\theta =$

10. (4 points) Express the expression $\frac{\tan(90^\circ - A)}{\cos A \sin A}$ in terms of sines and cosines and then simplify the expression.

Write your answer in the box below:

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11. (4 points) In a circle, an arc length of $\frac{33}{5}$ is intercepted by a central angle of $\frac{3}{2}$ radians. Find the radius r of the circle.

Write your answer in the box below:

$r =$

12. (4 points) If $\tan A = \frac{4}{3}$ and $\sin B = \frac{12}{13}$ and angles A and B are in Quadrant I, find the value of $\cos(A + B)$.

Write your answer in the box below:

$\cos(A + B) =$

13. (4 points) The endpoints of $\overline{CD}$ are $C(-2, 4)$ and $D(6, 2)$. Find the coordinates of the midpoint of $\overline{CD}$.

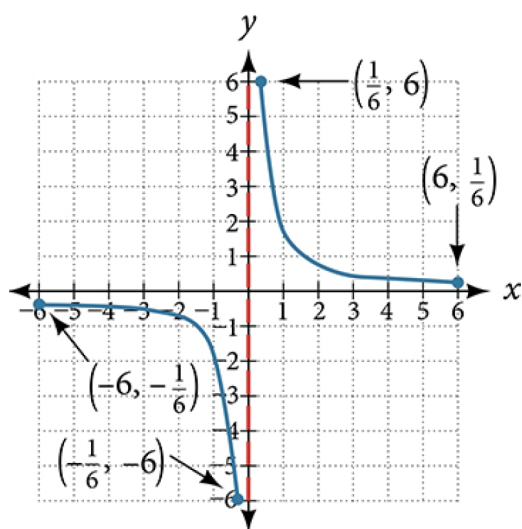
Write your answer in the box below:

14. (4 points) Solve the logarithmic equation $\log_{x+3} \left(\frac{x^3 + x - 2}{x} \right) = 2$ for x . **Do not check for extraneous solutions.**

Write your answer in the box below:

$x =$

15. (4 points) The graph of $y = f(x)$ is given below. Use the graph to find the range of f . Express your answer using interval notation.



Write your answer in the box below:

16. (4 points) Let $f(x) = x^2 - 6$ and $g(x) = 2^x - 1$. Find $(g \circ f)(-3)$.

Write your answer in the box below:

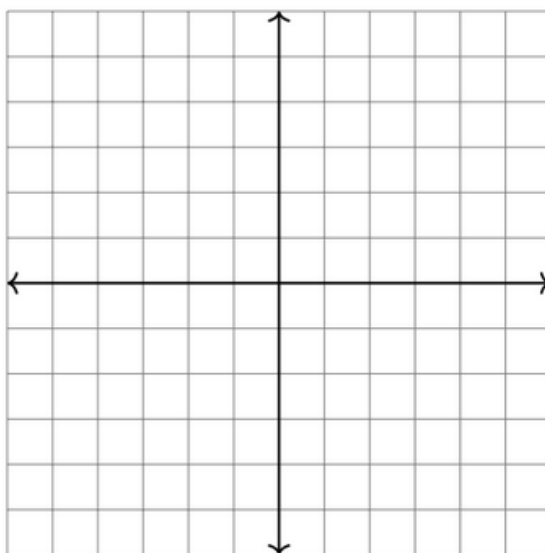
$(g \circ f)(-3) =$

17. (4 points) Let $f(x) = x^2 - 6$. Find $f^{-1}(x)$. State the domain and range of $f^{-1}(x)$.

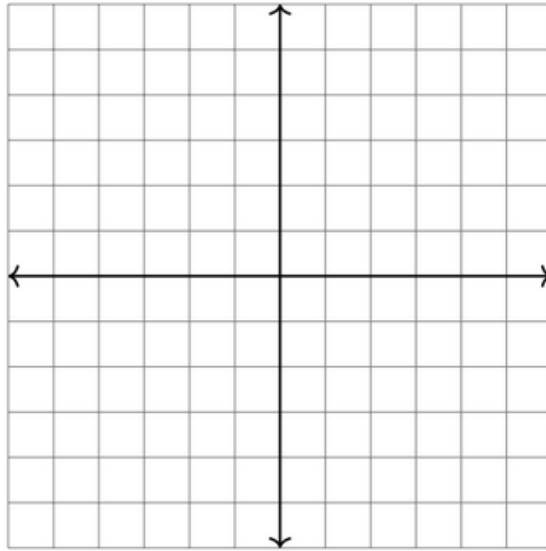
Write your answer in the box below:

$f^{-1}(x) =$	Domain:	Range:
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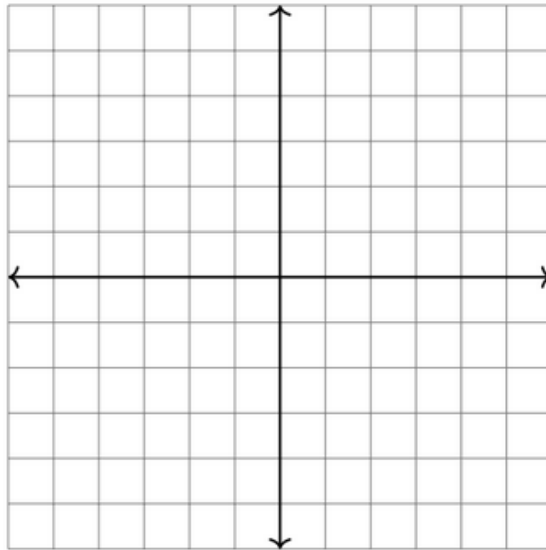
18. (4 points) Sketch the graph of $R(x) = \frac{x+2}{x-3}$. Label the asymptotes and intercepts on your graph.



19. (4 points) Sketch of the graph $h(x) = \begin{cases} -2x + 2 & \text{if } x < 0 \\ \sqrt{x} & \text{if } x \geq 0 \end{cases}$



20. (4 points) Graph the function $f(x) = -|x + 1| - 2$ by transforming the graph of $y = |x|$.



21. (4 points) Let $f(x) = -2 \cos(\pi x + 2\pi)$.

(a) ($\frac{1}{2}$ point) Find the amplitude of $f(x)$.

Write your answer in the box below:

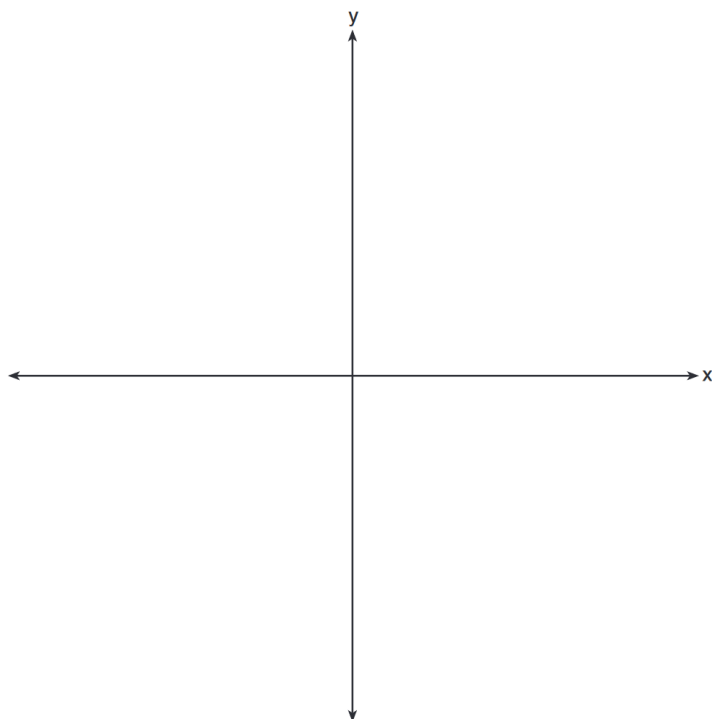
(b) ($\frac{1}{2}$ point) Find the period of $f(x)$.

Write your answer in the box below:

(c) (1 point) Find the horizontal shift of $f(x)$.

Write your answer in the box below:

(d) (2 points) Sketch one complete period of the graph of $f(x)$ in the interval $[-2, 0]$.



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