

Name _____

ZID _____

Directions:

1. **ALL WORK** should be organized to be readable and must be of sufficient depth to justify your answer by any method requested.
2. Correct answers with incorrect work or insufficient justification may receive no credit.
3. Give **EXACT** answers and **NOT** numeric approximations unless explicitly requested otherwise.
4. No Scratch paper outside of the Exam is permitted.
5. Only a basic **non-text capable, non-graphing** calculator is permitted.
6. **Graphing calculators, cell phones (turned off) and pdas shall be stowed out of sight. IF VISIBLE YOU WILL BE DEEMED TO BE CHEATING AND WILL RECEIVE A ZERO SCORE FOR THE EXAM!!!**

Problems: Check that your exam contains exactly 50 problems. Each problem is worth 5 points.

1. Simplify:

$$x^{-1/3}(x^3) \text{ (where } x > 0\text{)}.$$

2. Simplify:

$$\log_{10}(90) - \log_{10}(9).$$

3. Simplify:

$$\frac{\ln(x^2)}{\ln(x)}.$$

4. Rationalize the denominator:

$$\frac{1}{(\sqrt{3} + \sqrt{2})}$$

5. Factor the expression:

$$x^{-1/2}(x^2 + x) - 2x^{3/2} + 6x^{-1/2} \text{ (where } x > 0\text{)}.$$

6. What is the domain of the function f defined by $f(x) = \frac{x+1}{2-\sqrt{7-3x}}$?

7. Find the domain of $\log(x^6 - 16x^4)$.

8. Simplify $\cos\left(\cos^{-1}\left(-\frac{\pi}{7}\right)\right)$

9. Simplify $\cos^{-1}\left(\cos\left(-\frac{\pi}{7}\right)\right)$

10. Simplify $\frac{3^{\pi+1}}{3^{\pi-1}}$

11. If $f(t) = \frac{3}{t} + 4$, then $f^{-1}(t) =$

12. Simplify

$$\frac{x - \frac{25}{x}}{x + 5}$$

13. What is the average rate of change of $s(t) = -7t^2$ on $[-6, 1]$?

14. Find the solution(s) of the equation $e^{-2x+15} = 3$.

15. Solve $4^{-5x} = 2^{7+3x}$

16. If $f(x) = \frac{x-1}{x-5}$ then $\frac{f(1+h) - f(1)}{h} =$

For the next three problems consider:

$$f(x) = \frac{x+6}{3x-6} \quad \text{and} \quad g(x) = \frac{x+3}{x-2}.$$

17. Find the product $(fg)(x)$

18. Find and simplify the sum $(f+g)(x)$

19. Find and simplify the composition $(f \circ g)(x)$

20. Solve $17(2^{2x}) - 15(2^x) - 2 = 0$

21. The population of a midwestern city follows the exponential law. If the population decreased from 1,000,000 to 500,000 from 2004 to 2008, what will the population be in 2012?

22. Simplify $(\tan x) \left(\frac{1}{\sec x} + 3 \cot x \right)$

23. Verify whether or not the following is an identity:

$$2 \cos^2 t + \sin^2 t = 2 + \sin^2 t$$

24. Suppose that $\triangle ABC$ is a right triangle with $\angle C = \frac{\pi}{2}$. If $AC = 12$ and $BC = 9$:

$$\sin B =$$

$$\cos B =$$

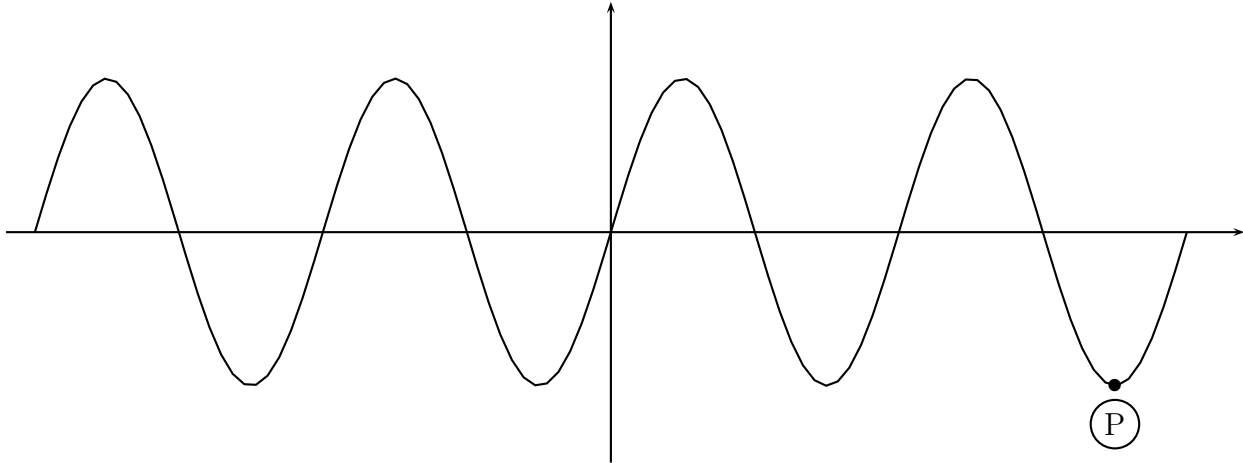
$$\tan B =$$

25. Express 570° in radians.

26. Two angles of a triangle are $\frac{\pi}{3}$ and $\frac{\pi}{5}$. What is the third angle?

27. Evaluate $\sin\left(\frac{13\pi}{3}\right)$

28. In the following graph of $y = \sin(x)$, what are the coordinates of the point P ?

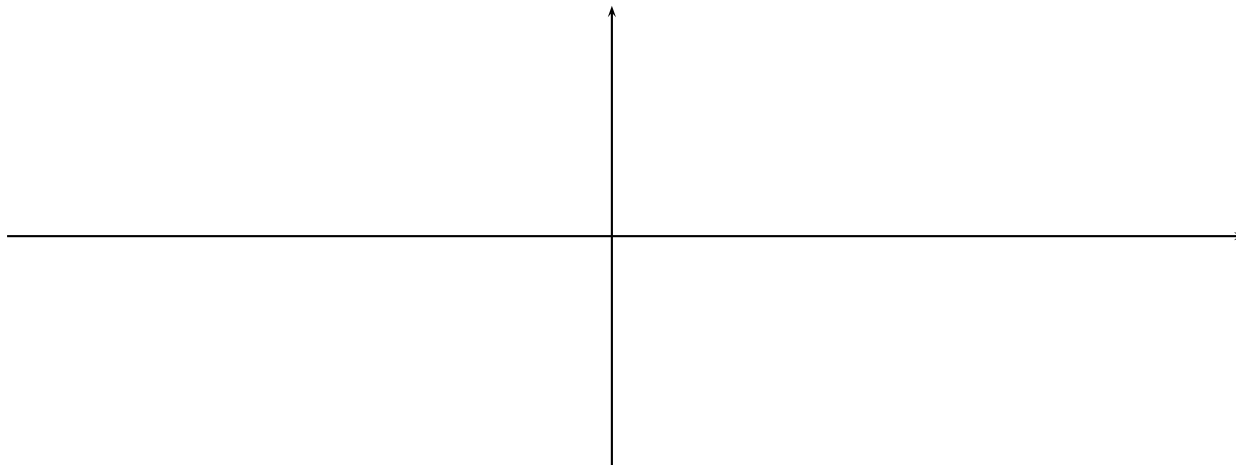


29. Simplify $\frac{\cos^2 t}{1 - \sin t} + \frac{\cos^2 t}{1 + \sin t}$

30. Solve $\sin(x) \cos(x) = -1$

31. What is the area of the triangle with sides $a = 3$, $b = 160$ and included angle $\theta = \frac{\pi}{6}$?

32. Sketch the graph of $y = \cos(x - \pi/3)$ on the interval $[0, 2\pi]$.



33. What is the period of $f(x) = -3 \sin(\pi x - 13)$?

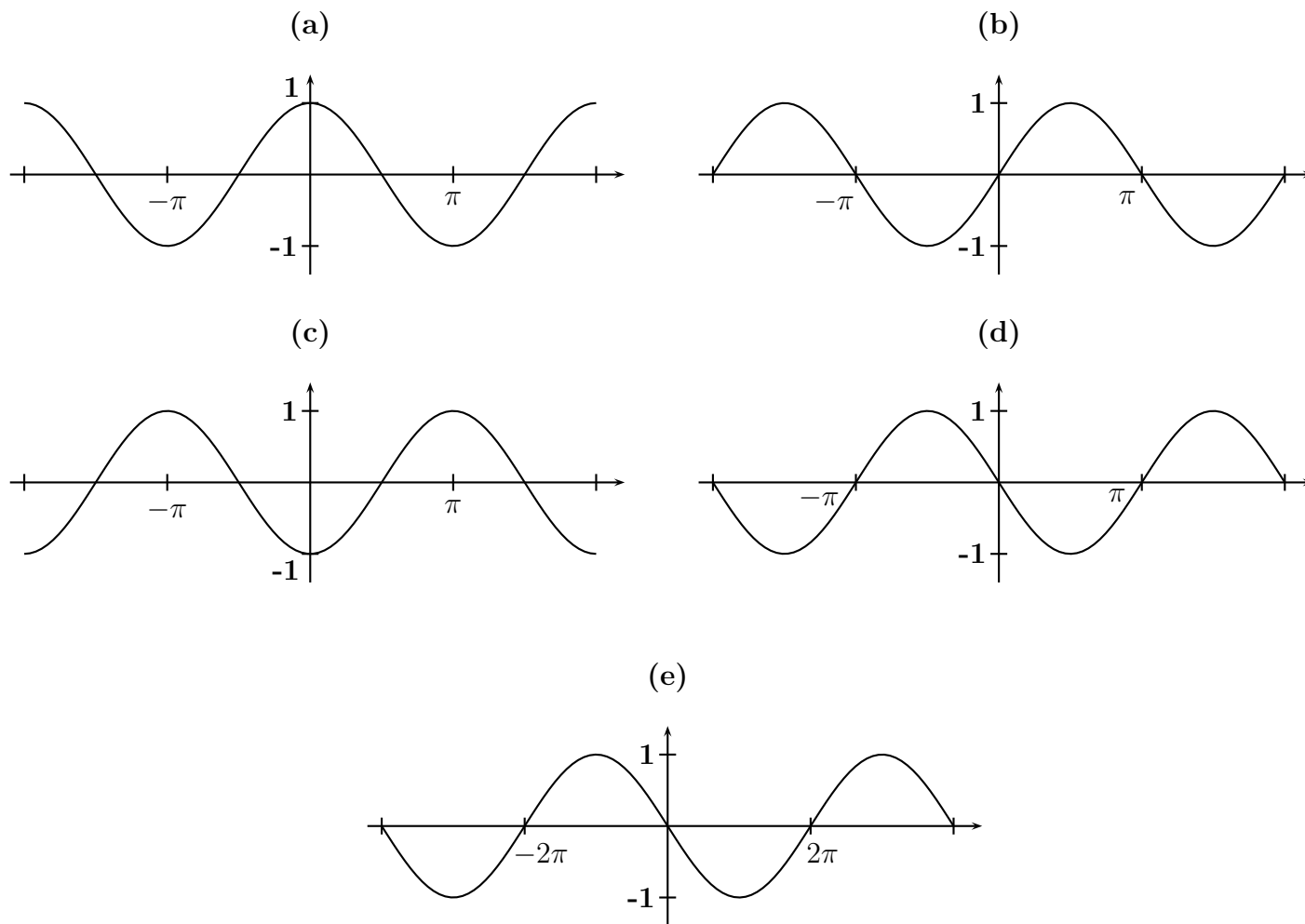
For the next two problems:

$$\sin A = -\frac{1}{3} \text{ with } \frac{3\pi}{2} < A < 2\pi \quad \text{and} \quad \cos B = -\frac{2}{5} \text{ with } \pi < B < \frac{3\pi}{2}$$

34. Find the exact value of $\cos(A - B)$:

35. Find the exact value of $\sin(A + B)$:

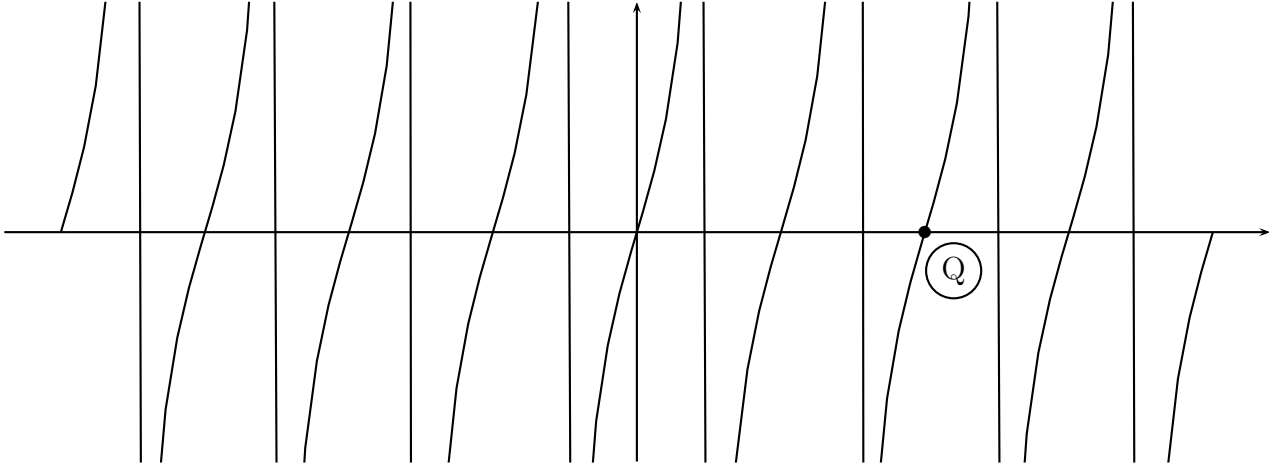
36. Which is the graph of $y = \cos(-x)$?



37. Find all angles θ in the range $-180^\circ \leq \theta \leq 180^\circ$ for which $\sin(\theta) = -\cos(\theta)$

38. Solve $\cos^2(\theta) + 3\cos(\theta) + 2 = 0$.

39. In the following graph of $y = \tan(x)$, give the coordinates of the point Q .



40. I want to construct a triangle with sides of length a, b, c opposite angles A, B, C respectively. If I want $a = 2, b = 5$ and $c = 7$, find $\cos(C)$ or show that no such triangle exists.

41. I want to construct a triangle with sides of length a, b, c opposite angles A, B, C respectively. If I want $\sin(A) = \frac{1}{14}, \sin(B) = \frac{1}{8}$ and $b = 21$, find a or show that no such triangle exists.

42. Convert polar coordinates of $(-7, -\frac{5\pi}{6})$ to rectangular coordinates:

43. Give all possible polar coordinates for the point with rectangular coordinates $(20, 20)$:

44. State whether the graph of $-7x^2 - 5y^2 + 23x - 46y + 7 = 0$ is a circle, a parabola, an ellipse (Not a circle) or a hyperbola. You may assume that it is one of these curves.

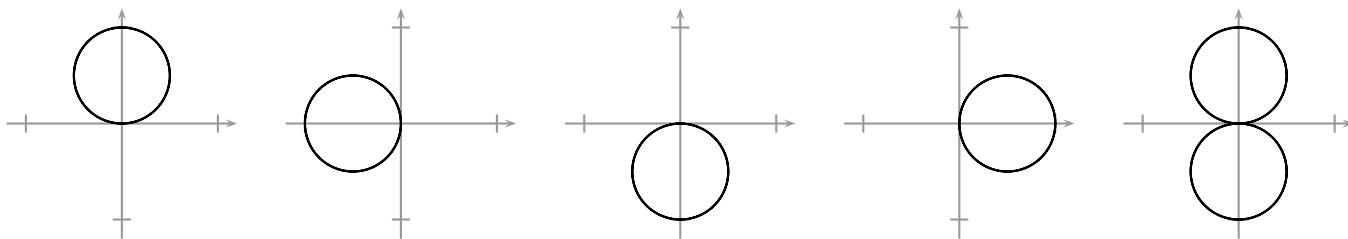
For the next two problems consider the parabola:

$$7y = x^2 + 12x + 50$$

45. Find the vertex.

46. Find the focus.

47. Which of the following is the graph of $r = 14 \cos \theta$?



- (a) (b) (c) (d) (e)
Complete the following tables with **EXACT** values:

48.

θ	$\sin \theta$
$\frac{\pi}{4}$	
$\frac{\pi}{2}$	
$\frac{\pi}{3}$	
π	
2π	
60°	
45°	
180°	

49.

θ	$\cos \theta$
$\frac{\pi}{4}$	
$\frac{\pi}{2}$	
$\frac{\pi}{3}$	
π	
2π	
60°	
45°	
180°	

50.

θ	$\tan \theta$
$\frac{\pi}{4}$	
$\frac{\pi}{2}$	
$\frac{\pi}{3}$	
π	
2π	
60°	
45°	
180°	