

SAMPLE PLACEMENT TEST TO BYPASS MATH 1505 (PART I – TRIGONOMETRY REVIEW)

Department of Mathematics and Statistics, University of Houston-Downtown

- Find the other five trigonometric functions of θ using the given information.
 $\tan \theta = \frac{5}{12}$; $\sin \theta > 0$
- How far are you from the base of a tree 100 feet tall if the angle of elevation to the top of the tree is 30° ?
- Graph exactly one period of each of the following functions.
A. $y = 2 \sin x + 1$ B. $y = \tan x$ C. $y = \cos 2x - 2$
- Prove the following identities by converting one side into the other.

A. $\sec x + \tan x = \frac{\csc x + 1}{\csc x \cos x}$ B. $2 - \sin^2 \theta = 1 + \cos^2 \theta$

C. $\frac{1}{1 + \cos y} + \frac{1}{1 - \cos y} = 2 \csc^2 y$

- Find the exact value of each of the following expressions.

A. $\text{Arc sin } \frac{1}{2}$ B. $\text{Cos}^{-1} \frac{\sqrt{2}}{2}$ C. $\cos^2 15^\circ + \sin^2 15^\circ$

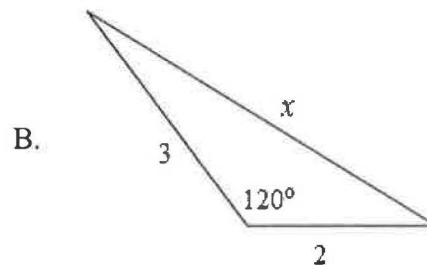
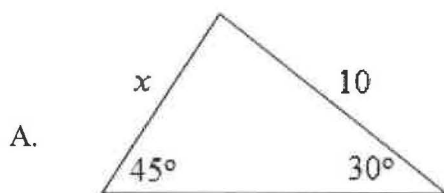
D. $\csc 60^\circ$ E. $\tan[\sec^{-1}(-3)]$ F. $\cot \frac{\pi}{4}$

- Solve the following equations for all x such that $0 \leq x < 2\pi$.

A. $2 \cos x \sin x = \sin x$ B. $\sec^2 x - \sec x - 2 = 0$

C. $\cos^2 x = \frac{1}{2}$

- Solve the following triangles for the unknown quantity.



- For the polar equation $r = 2 - 3 \sin \theta$, find the missing coordinate of the following points so that the resulting point will be in the graph of this equation.

A. $(?, \frac{5\pi}{4})$ B. $(2, ?)$ C. $(?, \frac{3\pi}{2})$

- Change the polar coordinates $(-3, \frac{5\pi}{4})$ to rectangular coordinates.

SAMPLE PLACEMENT TEST TO BYPASS MATH 1505 (PART II – PRECALCULUS REVIEW)

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- Find an equation of the line that passes through the point $(1, -2)$ and that is perpendicular to the line $2x + 4y = 1$.
- Find the inverse function of $f(x) = \frac{2x-5}{x-3}$, if it exists.
- Find all three zeros (or roots) of the polynomial $P(x) = x^3 + x$.
- Solve for x : $\log(28 + x) = \log(2 - x) + \log(2 - x)$.
- Solve for x : $7^{3x+1} = 100$.
- Find all horizontal and vertical asymptotes, if any, of $r(x) = \frac{5x+21}{x^2+10x+25}$.
- If $f(x) = 3x^2 + 1$, simplify the following expression: $\frac{f(x+h)-f(x)}{h}$.
- Identify the conic section given by the following equation and find its center:
$$x^2 + y^2 - 4x + 10y + 25 = 0$$
- Find the rectangular coordinates for the point whose polar coordinates are $(\sqrt{2}, -\pi/4)$.
- Find functions $f(x)$ and $g(x)$ so that $f(g(x)) = (2x + 1)^3$.
- A function f is given, and the indicated transformations are applied to its graph, in the given order.
Write the equation for the final transformed function $g(x)$.
 $f(x) = x^2$; shift 2 units to the left and reflect in the x -axis.
- Find the equation of the quadratic function $f(x)$ whose graph has vertex $(3,5)$ and y -intercept 23.
- Find the value of b if $\log_3 b = -2$.
- Find the sum of the first five terms of the arithmetic sequence whose first term is 25 and common difference is -2 .
- Find all possible rational zeros (or roots) of the polynomial $f(x) = 2x^3 - 7x^2 + 10x - 6$.
- Find the formula for a polynomial f of degree 3 with integer coefficients such that $f(1) = -2$ and both $1 - i$ and 3 are zeros (or roots) of the polynomial.
- Find the value of $\tan^{-1}(-1)$.
- Find polar coordinates for the point whose rectangular coordinates are $(0, -3)$.
- Find the sum of the first four terms of the geometric sequence whose first term is 3 and common ratio is 2.
- Find the equation of the circle that has a diameter with endpoints at $(-3, -2)$ and $(5, 4)$.
- Write the complex number $-1 + i\sqrt{3}$ in the polar form $r(\cos \theta + i \cdot \sin \theta)$.
- Use DeMoivre's Theorem to compute $(-1 + i\sqrt{3})^{12}$.
- Find the two foci of the ellipse with equation
$$\frac{x^2}{36} + \frac{y^2}{25} = 1$$
- Evaluate the expression
$$\sum_{k=0}^3 (k^3 + 2k)$$
- A sequence is defined recursively by $F_n = F_{n-1} + F_{n-2}$. If $F_0 = 0$ and $F_1 = 1$, find F_6 .

In problems 26-31, sketch the graph of the given function or equation.

26. $\frac{x^2}{4} + \frac{y^2}{16} = 1$

27. $f(x) = \frac{2x-3}{x-2}$

28. $y = e^x + 2$

29. $y = \begin{cases} 3, & \text{if } x \leq 0 \\ -x^2 - 2, & \text{if } x > 0 \end{cases}$

30. $y = x^3 + 2x^2 - 5x - 3$

31. $y = \log_{1/2}(x + 3)$

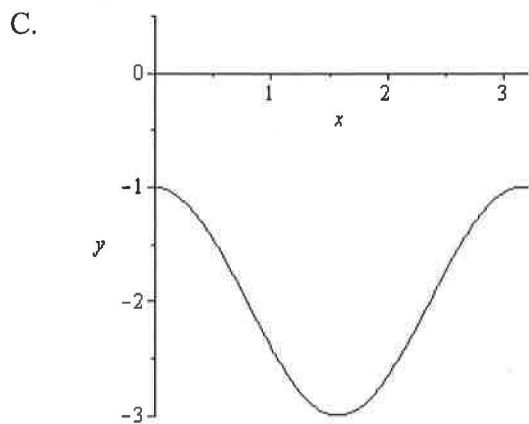
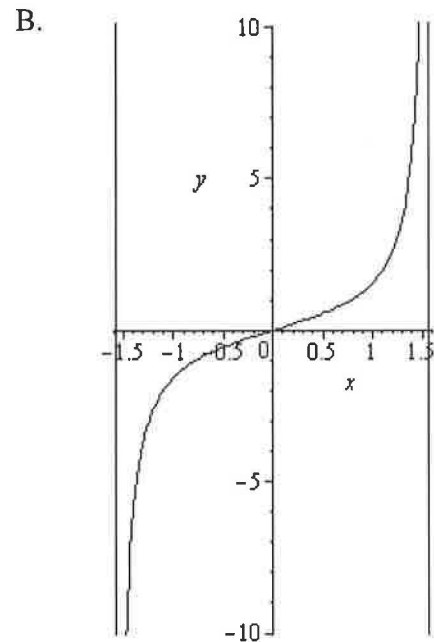
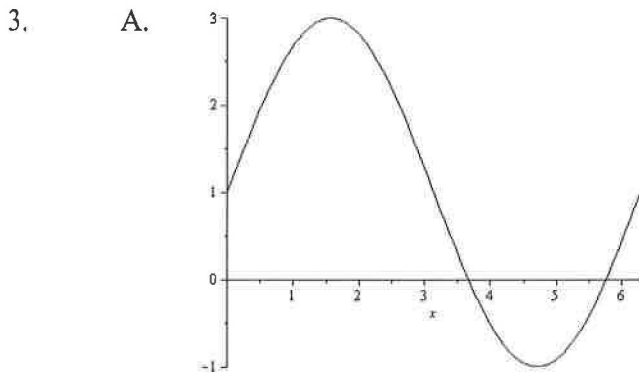
32. A polynomial of degree 4 can have at most how many x -intercepts?

33. A polynomial of degree 4 can have at most how many local extrema?

ANSWERS FOR SAMPLE PLACEMENT TEST TO BYPASS MATH 1505 (PART I – TRIGONOMETRY REVIEW)

1. $\sin \theta = \frac{5}{13}$ $\csc \theta = \frac{13}{5}$ $\cos \theta = \frac{12}{13}$ $\sec \theta = \frac{13}{12}$ $\tan \theta = \frac{5}{12}$ $\cot \theta = \frac{12}{5}$

2. Distance = $100\sqrt{3}$



5. A. $\text{Arc sin } \frac{1}{2} = 30^\circ \text{ or } \frac{\pi}{6}$ B. $\text{Cos}^{-1} \frac{\sqrt{2}}{2} = 45^\circ \text{ or } \frac{\pi}{4}$ C. $\cos^2 15^\circ + \sin^2 15^\circ = 1$

D. $\csc 60^\circ = \frac{2\sqrt{3}}{3}$ E. $\tan[\sec^{-1}(-3)] = -2\sqrt{2}$ F. $\cot \frac{\pi}{4} = 1$

6. A. $x = 0^\circ, 60^\circ, 180^\circ, 300^\circ$ or $x = 0, \frac{\pi}{3}, \pi, \frac{5\pi}{3}$ B. $x = 60^\circ, 180^\circ, 300^\circ$ or $x = \frac{\pi}{3}, \pi, \frac{5\pi}{3}$

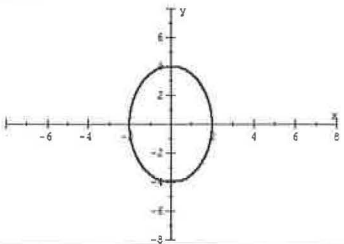
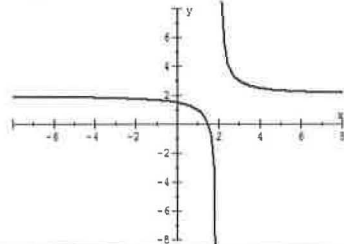
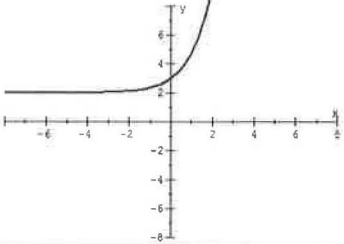
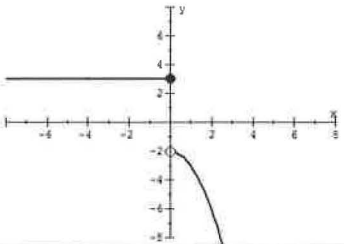
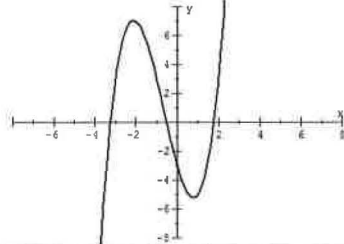
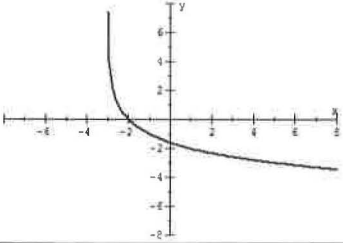
C. $x = 45^\circ, 135^\circ, 225^\circ, 315^\circ$ or $x = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$

7. A. $x = 5\sqrt{2}$ B. $x = \sqrt{19}$

8. A. $x = \frac{4 + 3\sqrt{2}}{2}$ B. $x = 0, \pm\pi, \pm 2\pi, \pm 3\pi, \dots$ C. 5

9. $\left(\frac{3\sqrt{2}}{2}, \frac{3\sqrt{2}}{2}\right)$

ANSWERS FOR SAMPLE PLACEMENT TEST TO BYPASS MATH 1505 (PART II – PRECALCULUS REVIEW)

1. $2x - y = 4$	2. $f^{-1}(x) = \frac{3x-5}{x-2}$	3. $x = 0, x = \pm i$
4. $x = -3$	5. $x = \frac{2}{3 \log 7} - \frac{1}{3}$	6. Horizontal asymptote is $y = 0$. Vertical asymptote is $x = -5$.
7. $6x + 3h$	8. A circle with center $(2, -5)$.	9. $(1, -1)$
10. $f(x) = x^3,$ $g(x) = 2x + 1$	11. $g(x) = -(x + 2)^2$	12. $f(x) = 2x^2 - 12x + 23$
13. $1/9$	14. 105	15. $\pm 1, \pm 2, \pm 3, \pm 6, \pm \frac{1}{2}, \pm \frac{3}{2}$
16. $f(x) = x^3 - 5x^2 + 8x - 6$	17. $-\frac{\pi}{4}$	18. $(3, \frac{3\pi}{2})$
19. 45	20. $(x - 1)^2 + (y - 1)^2 = 25$	21. $2(\cos \frac{2\pi}{3} + i \cdot \sin \frac{2\pi}{3})$
22. 2^{12}	23. $(\sqrt{11}, 0), (-\sqrt{11}, 0)$	24. 48
25. 8	26. 	27. 
28. 	29. 	30. 
31. 	32. 4	33. 3