Math 250 Algebra/Trig Pre-Test

This pre-test contains basic questions on algebra and trigonometry. Solutions are provided at the end of the test along with references to where you can go for additional review and practice problems. <u>It is important</u> that you work through any necessary review. When completed, move on to the Skills Assessment Test and begin your preparation for Calculus II.

You may click on the blue words if you wish to jump to an answer or the review topics.

If you would like to print the Pre-Test so you can work it out on paper, please click **Print**.

1.	Factor completely: $2x^4 - 5x^3 - 3x^2$.							
2.	Find the quotient and remainder for $\frac{x^3 - 2x - 3}{x - 2}$.	Answer						
3.	Expand $e^x (1 + e^{2x})^2$.	Answer						
4.	Complete the square given $x^2 - 6x - 2$.	Answer						
5.	Find the interval on which $ x - 3 < 1$.	Answer						
6.	Consider the function $f(x) = 2x - x^2$. Find and s $\frac{f(x+h) - f(x)}{h}$.	implify Answer						

7. Consider the function: $f(x) = \frac{x}{2^x}$. Find and simplify $\frac{f(n+1)}{f(n)}$. Answer

8. Fill in the blanks.

a) As $x \to -\infty$, $e^x \to$ _____. b) As $t \to 0$, $60(1 - e^{2t}) \to$ _____.

- c) As $x \to 0^+$, $\ln x \to$ ____.
- d) As $n \to \infty$, $\left(1 + \frac{1}{n}\right)^n \to \underline{\qquad}$.

Answers

The remaining problems should be done <u>without</u> a calculator.

9. Complete the following tables. (You know how helpful it is in Calc I to be able to evaluate the trig functions for the values of θ in the table. The same comment holds for Calc II.)

	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{3\pi}{4}$	$\frac{5\pi}{6}$	π
$\sin \theta$									
$\cos \theta$									
an heta					und				

9. (continued)

	$\frac{7\pi}{6}$	$\frac{5\pi}{4}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$	$\frac{5\pi}{3}$	$\frac{7\pi}{4}$	$\frac{11\pi}{6}$	2π
$\sin heta$								
$\cos heta$								
an heta				und				

Answers

10. Graph one period of the functions $\sin x$, $\cos x$, and $\tan x$. Answer

- 11. Fill in the blanks.
 - a) $\sin^{-1}(0) =$ ____; (b) $\arcsin\left(\frac{1}{2}\right) =$ ___; c) $\arctan(1) =$ ___; (d) $\tan^{-1}(-1) =$ __; e) $\sin^{-1}(-1) =$ _; (f) $\tan^{-1}\left(\frac{1}{\sqrt{3}}\right) =$ ___. Answers
- 12. As $x \to \frac{\pi}{2}^-$, $\tan x \to \underline{\qquad}$. As $x \to -\frac{\pi}{2}^+$, $\tan x \to \underline{\qquad}$.

This means that:

As
$$x \to \infty$$
, $\tan^{-1}(x) \to \underline{\qquad}$.
As $x \to -\infty$, $\tan^{-1}(x) \to \underline{\qquad}$. Answers

- 13. Complete the following identities.
 - a) $\sin^2 \theta + \cos^2 \theta =$ ______. b) $\tan^2 \theta +$ ______ = $\sec^2 \theta$. c) $\cos(a + b) =$ _______. d) $\sin(2\theta) =$ _______ (Answer in terms of $\sin \theta$ and $\cos \theta$). e) $\sin^2 \theta =$ ______ (Answer in terms of $\cos 2\theta$). f) $\cos^2 \theta =$ ______ (Answer in terms of $\cos 2\theta$). Answers
- 14. Solve the following trigonometric equations, where $0 \le \theta < 2\pi$.

a)
$$\cos \theta = \frac{\sqrt{3}}{2}$$

b) $\tan \theta = -1$
c) $1 - \sin \theta - 2\sin^2 \theta = 0$ Answers

15. If
$$\tan \theta = \frac{x}{4}$$
 where $x > 0$, find $\sin \theta$ and $\cos \theta$ in terms of x . Answer

ANSWERS to PRE-TEST

1. $x^2(2x+1)(x-3)$

Return to Problem

2.
$$x^2 + 2x + 2 + \frac{1}{x-2}$$

Return to Problem

3.
$$e^x + 2e^{3x} + e^{5x}$$

Return to Problem

4.
$$(x^2 - 6x + 9) - 2 - 9 = (x - 3)^2 - 11$$

Return to Problem

5.
$$-1 < x - 3 < 1$$
, or $2 < x < 4$

Return to Problem

6.
$$f(x+h) = 2(x+h) - (x+h)^{2}$$
$$\frac{f(x+h) - f(x)}{h} = \frac{2(x+h) - (x+h)^{2} - (2x-x^{2})}{h}$$
$$= \frac{2h - 2xh - h^{2}}{h}$$
$$= 2 - 2x - h$$

(see Math 150, Review Topic 3 for help.)

Return to Problem

7.
$$\frac{\frac{n+1}{2^{n+1}}}{\frac{n}{2^n}} = \frac{n+1}{2^{n+1}} \cdot \frac{2^n}{n} = \frac{1}{2} \left(\frac{n+1}{n}\right) = \frac{n+1}{2n}$$
 (see Math 250,
Review Topic 1
for help.)

Return to Problem

(see Math 108, Review Topic 4 for help.)

(see Math 150, Review Topic 5 for help.)

(see Math 150, Review Topic 7 for help.)

8.	a)	0
	b)	0
	c)	$-\infty$
	d)	e

Return to Problem

1	h	
L	л	
e.	,	

θ	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{3\pi}{4}$	$\frac{5\pi}{6}$	π
$\sin \theta$	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0
$\cos heta$	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0	$-\frac{1}{2}$	$-\frac{\sqrt{2}}{2}$	$-\frac{\sqrt{3}}{2}$	-1
an heta	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	und	$-\sqrt{3}$	-1	$-\frac{1}{\sqrt{3}}$	0

	$\frac{7\pi}{6}$	$\frac{5\pi}{4}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$	$\frac{5\pi}{3}$	$\frac{7\pi}{4}$	$\frac{11\pi}{6}$	2π
$\sin \theta$	$-\frac{1}{2}$	$-\frac{1}{\sqrt{2}}$	$-\frac{\sqrt{3}}{2}$	-1	$-\frac{\sqrt{3}}{2}$	$-\frac{1}{\sqrt{2}}$	$-\frac{1}{2}$	0
$\cos \theta$	$-\frac{\sqrt{3}}{2}$	$-\frac{1}{\sqrt{2}}$	$-\frac{1}{2}$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
an heta	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	und	$-\sqrt{3}$	-1	$-\frac{1}{\sqrt{3}}$	0

(see Math 150, Review Topics 9, 11, 12 for help.)

Return to Problem

(see Math 150, Review Topic 5

for help.)

10. $\sin x$



 $\cos x$



 $\tan x$





1

1. a)
$$\sin^{-1}(0) = 0$$

b) $\arcsin\left(\frac{1}{2}\right) = \frac{\pi}{6}$
c) $\arctan(1) = \frac{\pi}{4}$
d) $\tan^{-1}(-1) = -\frac{\pi}{4}$
e) $\sin^{-1}(-1) = -\frac{\pi}{2}$
f) $\tan^{-1}\left(\frac{1}{\sqrt{3}}\right) = \frac{\pi}{6}$

(see Math 150, Review Topics 15 and 16 for help.)

Return to Problem

12. As $x \to \frac{\pi^{-1}}{2}$, $\tan x \to \infty$.

As $x \to -\frac{\pi^+}{2}$, $\tan x \to -\infty$. (See the graph of $\tan x$ in the solution to problem 10 above.)

As
$$x \to \infty$$
, $\tan^{-1}(x) \to \frac{\pi}{2}$.
As $x \to -\infty$, $\tan^{-1}(x) \to -\frac{\pi}{2}$.

(see Math 150, Review Topic 15 for help.)

Return to Problem

13. a)
$$\sin^2 \theta + \cos^2 \theta = 1$$

b) $\tan^2 \theta + 1 = \sec^2 \theta$
c) $\cos(a+b) = \cos a \cos b - \sin a \sin b$
d) $\sin 2\theta = 2 \sin \theta \cos \theta$
e) $\sin^2 \theta = \frac{1 - \cos 2\theta}{2}$
f) $\cos^2 \theta = \frac{1 + \cos 2\theta}{2}$

(see Math 150, Review Topics 14 and 17 for help.)

Return to Problem

14. a)
$$\cos \theta = \frac{\sqrt{3}}{2} \Rightarrow \theta = \frac{\pi}{6}, \frac{11\pi}{6}$$

b) $\tan \theta = -1 \Rightarrow \theta = \frac{3\pi}{4}, \frac{7\pi}{4}$ (See the table in the solution to problem 9 above.)

c)
$$1 - \sin \theta - 2 \sin^2 \theta = 0$$

$$(1 - 2\sin\theta)(1 + \sin\theta) = 0$$
$$\sin\theta = \frac{1}{2} \left| \sin\theta = -1 \\ \theta = \frac{\pi}{6}, \frac{5\pi}{6} \right| \theta = \frac{3\pi}{2}$$

(see Math 150, Review Topic 16 for help.)

Return to Problem

15. If $\tan \theta = \frac{x}{4}$ where x > 0, we can draw the following picture.



(see Math 150, Review Topic 9c for help.)

Return to Problem

Math 250 Web Page

Top of File

Math 250 Review Topics

