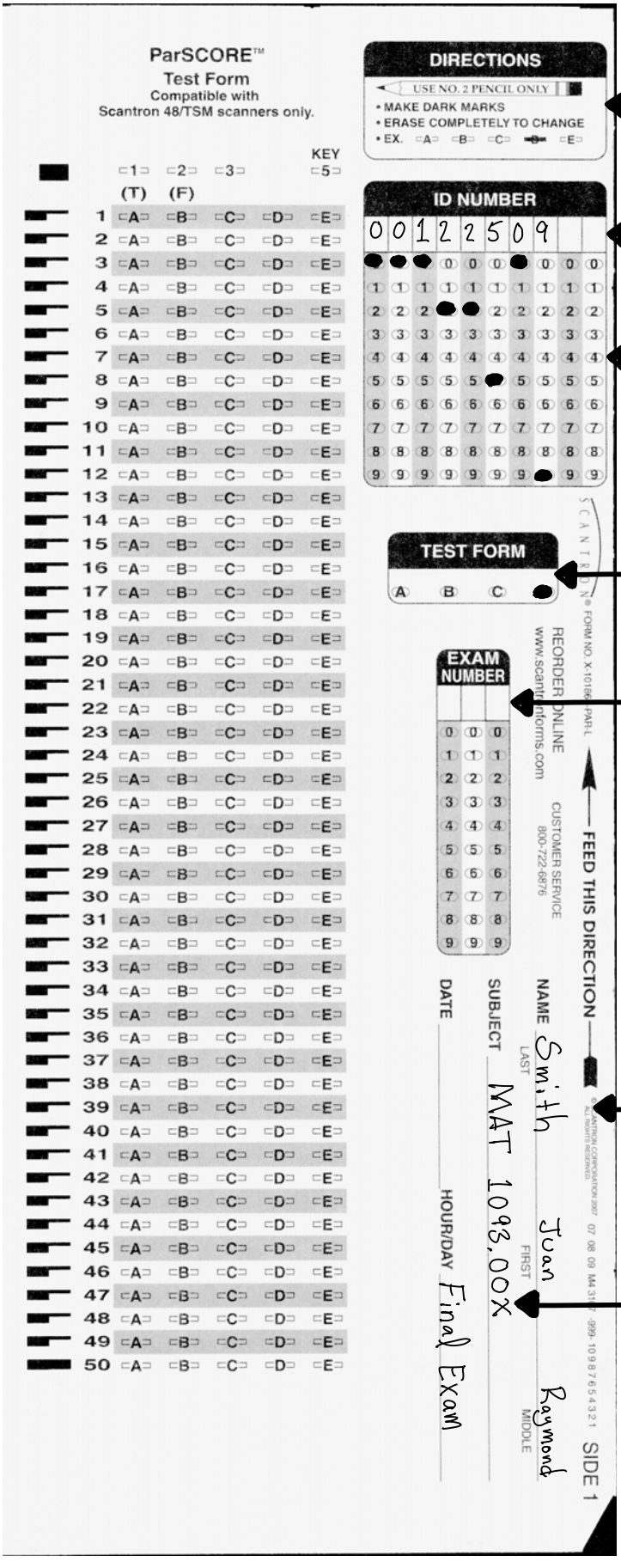
PRECALCULUS **Spring 2008** **Final Exam**

Name_____ Banner:_____

Write your last name, first name and middle name here.



Follow these directions.

If you've smudged your parscore then copy your answers to a clean parscore.

Enter your Banner I.D. (excluding the @ symbol)

Fill in the appropriate bubbles.

You have Test Form D so fill in bubble D.

Leave this blank

Write your last name, first name and middle name here.

Replace the x with the appropriate number for the section that you are enrolled. Look at the chart below if you don't know your section.

Class Days	Time	1093.section
MWF	8am	1093.001
MWF	10am	1093.002
MWF	2pm	1093.003
TTR	9:30am	1093.006

INSTRUCTIONS

Circle your answers on this exam and fill in the corresponding bubble on your ParScore.

You are NOT allowed to use calculators or formula sheets.

Separate the pages of the exam and use the back of the paper as scratch paper.
I'll have a stapler to staple your exam back together.

Cover your work and your Parscore. Don't cheat or appear to be cheating.

If something is illegible then please notify me.
If a question is ambiguous then please ask me to clarify.

DON'T GIVE UP! Do your best on every problem.
You are not supposed to already know the answer, you are to figure it out using what you know.

Use all of your available time. If you finish early, redo the problems to verify correctness. Don't "check your work" - redo it separately without looking at your previous work to avoid making the same mistakes twice.

When you are done, turn in this test and your Parscore.

OTHER INFORMATION

Your exam grades will be available in WebCT as soon as the Parscore office uploads them to WebCT. When this will occur depends on how many other classes are ahead of us on the Parscore Office's list (They take care of all the Parscores at UTSA).

#1) While standing on the surface of the Earth you may feel like you are not moving, but indeed you are because the Earth is rotating and revolving around the Sun, which itself is orbiting the center of the Milky Way Galaxy. Considering only the rotation of the Earth, you have an angular speed of w = 1 rev/day. Considering that your linear speed depends upon where you are on the surface of the Earth. Which of the following statements is completely true?

A) Your maximum linear speed caused by Earth's rotation occurs when you are on the Equator.

B) Your maximum angular speed occurs when you are on the North or South Pole.

C) If you drive North from UTSA keeping your speedometer at 70 mph, your distance from the Earth's axis of rotation becomes smaller as you approach the North Pole causing your total linear speed (speed of your car across the surface of the Earth plus the speed of the surface of the Earth's surface with respect to its center) to steadily increase.

D) All of the above.

E) None of the above.

#2) Which of the following pairs of equations have the same set of solutions?

A) $\sin\theta - \sqrt{3}\cos\theta = 2 \Leftrightarrow \sqrt{3}\sin\theta + \cos\theta = 2$

B) $2\sin^2\theta - 3\sin\theta = -1 \Leftrightarrow 2\cos^2\theta + \cos\theta = 1$

C) $\cos^2\theta - 2\sin^2\theta - 1 = 0 \Leftrightarrow \sin^2\theta - 2\cos^2\theta - 1 = 0$

D) All of the above.

E) None of the above.

#3) Which of the following is an identity?

A) $(2a\sin\theta\cos\theta)^2 + a^2(\cos^2\theta - \sin^2\theta)^2 = a^2$

B) $(\tan\alpha + \tan\beta)(1 - \cot\alpha\cot\beta) + (\cot\alpha + \cot\beta)(1 - \tan\alpha\tan\beta) = 0$

C) $\dfrac{1 + \cos\theta + \sin\theta}{1 + \cos\theta - \sin\theta} = \sec\theta + \tan\theta$

D) All of the above.

E) None of the above.

#4) Which of the following is an identity?

A) $\tan(\sin^{-1}v) = \dfrac{v}{\sqrt{1-v^2}}$

B) $\sin(\cos^{-1}v) = \sqrt{1-v^2}$

C) $\cos(\tan^{-1}v) = \dfrac{1}{\sqrt{1+v^2}}$

D) All of the above.

E) None of the above.

#5) Solve for θ: $\sqrt{2\sin(\theta^2)} = \sqrt{\sqrt{3}}$

A) $\theta \in \{ \pm\sqrt{\pi/3} + 2k\pi, \pm\sqrt{2\pi/3} + 2k\pi \; ; k \in \mathbb{Z} \}$

B) $\theta \in \{ \pm\sqrt{\pi/3 + 2k\pi}, \pm\sqrt{2\pi/3 + 2k\pi} \; ; k \in \mathbb{Z} \}$

C) $\theta \in \{ \sqrt{\pi/3 + 2k\pi}, \sqrt{2\pi/3 + 2k\pi} \; ; k \in \mathbb{Z} \}$

D) $\theta \in \{ \pi/3 + 2k\pi, 2\pi/3 + 2k\pi \; ; k \in \mathbb{Z} \}$

E) None of the above.

#6) Solve for θ: $\sin(3\theta) = -\sin\theta$

A) $\theta \in \{ 2k\pi, \pi + 2k\pi ; k \in \mathbb{Z} \}$

B) $\theta \in \{ k\pi \; ; k \in \mathbb{Z} \}$

C) $\theta \in \{ k\pi/2 ; k \in \mathbb{Z} \}$

D) $\theta \in \{ k\pi/2 + k\pi \; ; k \in \mathbb{Z} \}$

E) None of the above.

#7) Solve for θ: $\cos(3\theta) = -3\cos^3\theta$

A) $\theta \in \{ \pm\sqrt[3]{\pi/6 + 2k\pi} \; ; k \in \mathbb{Z} \}$

B) $\theta \in \{ k\pi, (3k+1)\pi/2 \; ; k \in \mathbb{Z} \}$

C) $\theta \in \{ k\pi/2 \; ; k \in \mathbb{Z} \}$

D) $\theta \in \{ (2k+1)\pi/2 \; ; k \in \mathbb{Z} \}$

E) None of the above.

#8) Solve for θ: $\sin^2(4\theta) - \cos^2(4\theta) = 0$

A) $\theta \in \{(2k+1)\pi/4, (2k+1)\pi/2 \; ; k \in \mathbb{Z}\}$

B) $\theta = k\pi/8 \; ; k \in \mathbb{Z}$

C) $\theta = k\pi/4 \; ; k \in \mathbb{Z}$

D) No real valued solutions**.**

E) None of the above.

#9) Solve for θ: $\sqrt{3}\cos(\sqrt{3}\theta) + \sin(\sqrt{3}\theta) = \sqrt{3}$

A) $\theta \in \{ \pm\pi/\sqrt{3} + 2k\pi/\sqrt{3} \; ; k \in \mathbb{Z} \}$

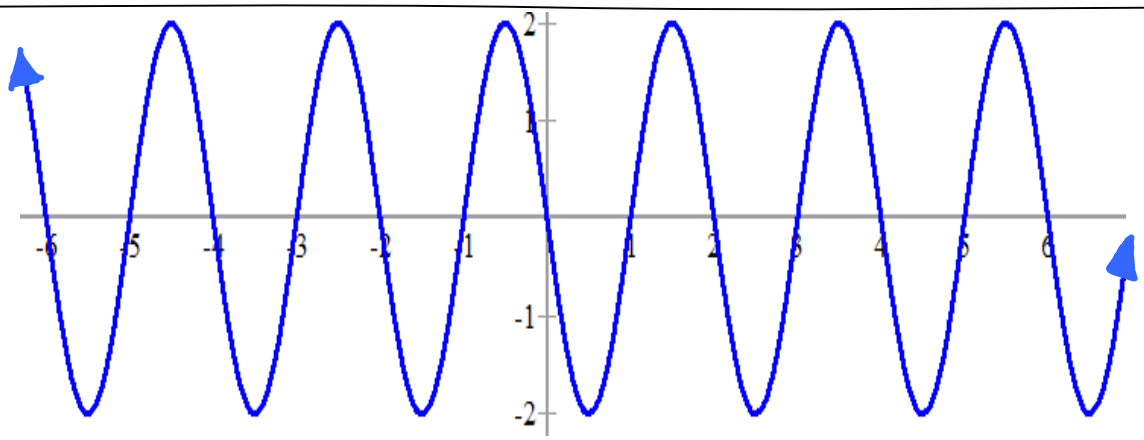
B) $\theta \in \{ \pm 2\sqrt{3}k\pi/3 \; ; k \in \mathbb{Z} \}$

C) $\theta \in \{ \sqrt{3}\pi/9 + 2\sqrt{3}k\pi/3, \; 2\sqrt{3}k\pi/3 \; ; k \in \mathbb{Z} \}$

D) No real valued solutions**.**

E) None of the above.

#10) This is a graph of which of the following functions?



A) $y = 2\cos(\pi x)$ **B)** $y = 2\sin(\pi x - \pi)$ **C)** $y = 2\cos(2x - \pi)$

D) $y = 2\sin(\pi x/2 + \pi/2)$ **E)** None of the above.

#11) If f(z) = sin(2/z) then

A) $f(-z) = f(z)$ **B)** $f(2/z) = \sin z$ **C)** $f(2) = \pi/2$

D) All of the above. **E)** None of the above.

#12) Suppose $f(y) = \sin\left(\frac{1}{y}\right)$. Which of the following is true for f(y):

A) f is defined for all $y = 0$,

B) f is defined for all y such that $-\infty < y \leq 0$ and $0 < y < \infty$,

C) f is undefined for $y = \cos\left[n\pi + \frac{\pi}{2}\right]$ if $n \in \mathbb{Z}$,

D) f(y) is undefined for all y such that $\theta = 0$,

E) None of the above.

#13) Which of the following is completely true?

A) $\cos(1^\circ) - \cos(2^\circ) + \cos(3^\circ) - \cos(4^\circ) + \cdots + \cos(359^\circ)$

$= -\sin(1^\circ) + \sin(2^\circ) - \sin(3^\circ) + \sin(4^\circ) + \cdots - \sin(359^\circ)$

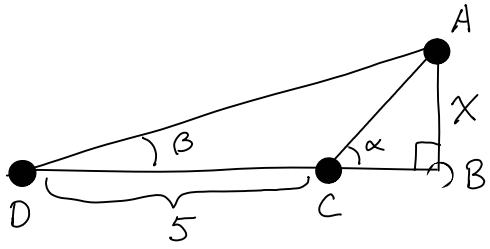
B) $\cos^2(1^\circ) + \cos^2(2^\circ) + \cdots + \cos^2(359^\circ) = 1$

C) $\tan(1^\circ) + \tan(2^\circ) + \cdots + \tan(89^\circ) + \tan(91^\circ) + \cdots + \tan(179^\circ) = \tan(181^\circ) + \cdots + \tan(269^\circ) + \tan(271^\circ) + \cdots + \tan(359^\circ)$

D) All of the above.

E) None of the above.

#14) For the following diagram, given $\alpha = 50^\circ$ and $\beta = 20^\circ$, solve for x.



A) $\dfrac{5\tan(50^\circ)\tan(20^\circ)}{\tan(50^\circ) + \tan(20^\circ)}$

B) $\dfrac{5\tan(50^\circ)\tan(20^\circ)}{\tan(20^\circ) - \tan(50^\circ)}$

C) $\dfrac{5\tan(50^\circ)\tan(20^\circ)}{\tan(50^\circ) - \tan(20^\circ)}$

D) $5[\tan(70^\circ) - \tan(50^\circ) + \tan(20^\circ)]$

E) None of the above.

#15) Solve for θ: $2\sin(\theta^2 + 2\theta + 1) = 1$

A) $\theta \in \{\pm\sqrt{\pi/6 + 2\pi K} - 1,\ \pm\sqrt{5\pi/6 + 2\pi K} - 1 ;\ K \in \mathbb{Z}\}$

B) $\sin(\theta^2) = 1/2,\ \sin(2\theta) = 1/2$

C) $\theta \in \{\pi/6 + 2\pi K,\ 5\pi/6 + 2\pi K ;\ K \in \mathbb{Z}\}$

D) $\theta \in \{(\pi/6 + 2\pi K)^2 + 2(\pi/6 + 2\pi K) + 1,\ (5\pi/6 + 2\pi K)^2 + 2(5\pi/6 + 2\pi K) + 1 ;\ K \in \mathbb{Z}\}$

E) None of the above.

#16 - 30 are EXTRA CREDIT

#16) $r[\cos\theta \pm i\sin\theta] = re^{\pm i\theta}$ in complex exponential notation. What is $\tan\theta$?

A) $\frac{e^{i\theta}+e^{-i\theta}}{2}$ **B)** $\frac{e^{i\theta}+e^{-i\theta}}{2i}$ **C)** $\frac{e^{i\theta}-e^{-i\theta}}{2}$

D) $\frac{e^{i\theta}-e^{-i\theta}}{2i}$ **E)** None of the above.

#17) $\log_{10}\left(x^2\sqrt{x^3+1}\right) =$

A) $2\log_{10}(x) + \frac{\log_{10}(x^3+1)}{2}$

B) $2(1/2)(3)\left[\log_{10}(x) + \log_{10}\left(\sqrt{x^3+1}\right)\right]$

C) $\log_{10}(x^2)\cdot\log_{10}\left(\sqrt{x^3+1}\right)$

D) All of the above.

E) None of the above.

#18) Solve for $2^{x+1}\cdot 16^{-x} = 1/2$

A) $x = 3/2$ **B)** $x = 2/3$ **C)** $x = 0$ **D)** $x = \log_2$ **E)** None of the above.

#19) Which of the following is completely true? Note: $\cos\theta + i\sin\theta = e^{i\theta}$

A) $\cos\theta = \frac{e^{i\theta}+e^{-i\theta}}{2}$ and $\sin\theta = \frac{e^{i\theta}-e^{-i\theta}}{2i}$

B) $0 = 1 + e^{i\pi}$ and $1 = e^{i2\pi}$

C) If $z = x+iy$ then e^z has radius $r = e^x$ and angle $\theta = y$

D) All of the above.

E) None of the above.

#20) Completely factor the polynomial: $z^6 + 64 = 0$

A) $(z-2)(z+2)(z-2i)(z+2i)\left[z-(\sqrt{2}+\sqrt{2}i)\right]\left[z+(\sqrt{2}+\sqrt{2}i)\right]=0$

B) $(z-2)(z+2)\left[z-(\sqrt{2}+\sqrt{2}i)\right]\left[z+(\sqrt{2}+\sqrt{2}i)\right]\left[z-(\sqrt{3}-i)\right]\left[z+(\sqrt{3}-i)\right]=0$

C) $(z-2i)(z+2i)\left[z-(1+\sqrt{3}i)\right]\left[z+(1+\sqrt{3}i)\right]\left[z-(1-\sqrt{3}i)\right]\left[z+(1-\sqrt{3}i)\right]=0$

D) $\left[z-(\sqrt{3}+i)\right]\left[z-2i\right]\left[z-(-\sqrt{3}+i)\right]\left[z-(-\sqrt{3}-i)\right]\left[z-(-2i)\right]\left[z-(\sqrt{3}-i)\right]=0$

E) None of the above.

#21) Which of the following is completely true?

A) $2^{3x} = 3^{2x+1} \Leftrightarrow 3^{2x} = 2^{3x+1}$

B) $\log_6(x+3) + \log_6(x+4) = 1 \Leftrightarrow \log_6\left[\frac{1}{x+3}\right] + \log_6\left[\frac{1}{x+4}\right] = -1$

C) $16^{x+2} = 8^{x-3} \Leftrightarrow 27^{x+3} = 81^{x-2}$

D) All of the above.

E) None of the above.

#22) Find the product of the eight 8th roots of unity (1). (In other words, find the roots and multiply them all together.)

A) 1

B) -1

C) i

D) $-i$

E) None of the above

#23) Write the given complex number, z, in standard, or rectangular, form.

$$z = \sqrt{8}\left[\cos\left(-\frac{\pi}{3}\right) + i\sin\left(-\frac{\pi}{3}\right)\right]$$

A) $\sqrt{6} - \sqrt{2}i$

B) $\cos\left(-\frac{\pi}{3}\right) + \sqrt{2}i$

C) $\sqrt{2} - \sqrt{6}i$

D) All of the above.

E) None of the above.

#24) Find all solutions, real or not, to the following equation: $x^3 + 2x^2 + 2x = 0$

A) $x \in \{0, -1 \pm i\}$

B) $x \in \{0, 1 \pm i\}$

C) $x \in \{0, \pm 2i\}$

D) All of the above.

E) None of the above.

#25) Expand: $\log_4(5x^3y)$

A) $3\log_4(5xy)$

B) $5\log_4(5x^3y)$

C) $\log_4(5) + 3\log_4(x) + \log_4(y)$

D) All of the above.

E) None of the above.

#26) Simplify: $\frac{1}{3}\left[\log_2(x) + \log_2(x+1)\right]$

A) $\log_2(x^2+x)^3$

B) $\log_2\left[x^{1/3} + (x+1)^{1/3}\right]$

C) $\log_2\left[\sqrt[3]{x(x+1)}\right]$

D) All of the above.

E) None of the above.

#27) Solve for x: $e^{2x} - 3e^{x} + 2 = 0$

A) $x = \ln(2)$

B) $x \in \{0, \sqrt{e}\}$

C) $x \in \{0, \ln(2)\}$

D) All of the above.

E) None of the above.

#28) Solve for x: $\log_3(5x-1) = \log_3(x+7)$

A) $x = \sqrt{2}$

B) $x = 2$

C) $x = \log_3(2)$

D) All of the above.

E) None of the above.

#29) Which of the following is a cube root of z = -2 + 2i

A) $\sqrt{2}\left[\cos\left(\frac{11\pi}{12}\right) + i\sin\left(\frac{11\pi}{12}\right)\right]$

B) $1 + i$

C) $\sqrt{2}\left[\cos\left(\frac{19\pi}{12}\right) + i\sin\left(\frac{19\pi}{12}\right)\right]$

D) All of the above.

E) None of the above.

#30) If $z_1 = 24[\cos(300°) + i\sin(300°)]$ and $z_2 = 8[\cos(75°) + i\sin(75°)]$ then what is $\frac{z_1}{z_2}$?

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

B) $-3/2 - 3i/2$

C) $3[\cos(75°) + i\sin(75°)]$

D) All of the above.

E) None of the above.