Precalculus Exam #2 Fall 2006

Name: _____ Banner: _____

* Write your name and Banner I.D. number in the appropriate places on this exam and your Parscore.
* Be sure to fill in the corresponding bubbles on your Parscore for your Banner I.D.
* Do NOT replace the @ in your I.D. with a zero. Simply ignore it.

Place your I.D number in the parscore from left to right starting from the far left side.

* This is Test Form A. Fill in this bubble on your Parscore under Test Form.

The Exam Number need not be filled in. Subject, Date, Hour/Day are also not necessary.

* Circle your answers on this test as well as fill in the corresponding bubbles on the Parscore.

Feel free to tear the pages of this exam apart as to write on the backsides for scratch work.

Return this exam and your Parscore to me when you are done.

* Do the easier problems first. Don't cheat. Cover your work. Ask me if a question is unclear, ambiguous, or illegible.
* THERE IS ONE ANSWER PER PROBLEM. SELECT ONE LETTER.

#1 Find all solutions to the equation $a\sin\theta - b\cos\theta = c$ where a, b and c are all positive real numbers.

a) $\frac{a}{\sqrt{a^2+b^2}} + 2n\pi$ b) $\sin^{-1}\left(\frac{c}{\sqrt{a^2+b^2}}\right) + 2n\pi$ c) $\phi + \sin^{-1}\left(\frac{c}{\sqrt{a^2+b^2}}\right) + 2n\pi$

where ϕ is an angle such that $\cos\phi = \frac{a}{\sqrt{a^2+b^2}}$ and $\sin\phi = \frac{b}{\sqrt{a^2+b^2}}$

d) $\phi + \sin^{-1}\left(\frac{c}{\sqrt{a^2+b^2}}\right) + 2n\pi$

$\phi + \pi - \sin^{-1}\left(\frac{c}{\sqrt{a^2+b^2}}\right) + 2n\pi$

where ϕ is an angle such that $\cos\phi = \frac{a}{\sqrt{a^2+b^2}}$ and $\sin\phi = \frac{b}{\sqrt{a^2+b^2}}$

e) None of the above

#2 Find all solutions to the equation $2\sin(\theta^2+2\theta+1) = 1$

a) $\pm\sqrt{\pi/6+2n\pi} - 1, \pm\sqrt{5\pi/6+2n\pi} - 1$ b) $\sin(\theta^2) = 1/2$, $\sin(2\theta) = 1/2$

c) $\pi/6+2n\pi$, $5\pi/6+2n\pi$ d) $(\pi/6+2n\pi)^2 + 2(\pi/6+2n\pi) + 1$, $(5\pi/6+2n\pi)^2 + 2(5\pi/6+2n\pi) + 1$

e) None of the above

#3 Find $\cos(3\theta)$ and $\sin(3\theta)$ in terms of 3rd degree polynomials in $\cos\theta$ and $\sin\theta$.

* A 3rd degree polynomial in x has the form $a_3x^3 + a_2x^2 + a_1x + a_0$ where a_3, a_2, a_1, a_0 are real numbers and are called the coefficients. Examples include $3x^3 + 6x^2 - x + 3$, $x^3 + 6x$, $9x^3 + x^2 - 6$, and $17x^3$. An nth degree polynomial has the form $a_n x^n + a_{n-1}x^{n-1} + \cdots + a_1 x + a_0$ or written in more compact notation $\sum_{i=0}^{n} a_i x^i$.

a) $\cos(3\theta) = 3\cos^3\theta + 2\cos^2\theta + \cos\theta$
$\sin(3\theta) = \cos^3\theta - 2\cos^2\theta - 3\cos\theta$

b) $\cos(3\theta) = 6\cos^3\theta - 3\cos\theta$
$\sin(3\theta) = 3\sin^3\theta + 6\sin\theta$

c) $\cos(3\theta) = 4\cos^3\theta - 3\cos\theta$
$\sin(3\theta) = -4\sin^3\theta + 3\sin\theta$

d) $\cos(3\theta) = 3\cos^3\theta - 4\cos\theta$
$\sin(3\theta) = 4\sin^3\theta - 3\sin\theta$

e) None of the above

#4 Find $\cos(6\theta)$ in terms of a 6th degree polynomial in $\cos\theta$.

a) $\cos(6\theta) = 2^6\cos(6\theta) - 2^3\cos(3\theta) + 1$

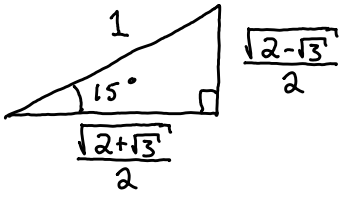
b) $\cos(6\theta) = 32\cos^6\theta - 48\cos^4\theta + 18\cos^2\theta - 1$

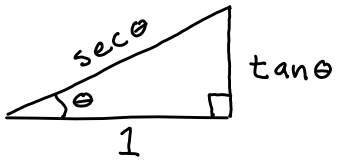
c) $\cos(6\theta) = 48\cos^6\theta - 32\cos^4\theta + 18\cos^2\theta - 1$

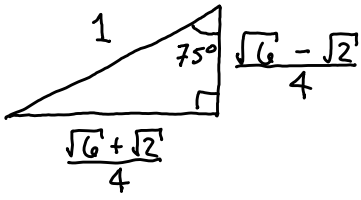
d) $\cos(6\theta) = 6\cos^6\theta - 4\cos^2\theta + 6$

e) None of the above

#5 Which of the following triangles is labeled correctly?

a) 

b) 

c) 

d) All of the above

e) None of the above

#6 Given that:

$\sin\theta$ = Vader	$\csc\theta$ = Light	$\sin(2\theta)$ = Deathstar
$\cos\theta$ = Darth	$\sec\theta$ = Saber	$\cos(2\theta)$ = Anakin
$\tan\theta$ = Luke	$\cot\theta$ = Skywalker	$\tan(2\theta)$ = ObiwanKenobi

Which of the following are <u>false</u>?

a) Luke Skywalker is Darth Vader

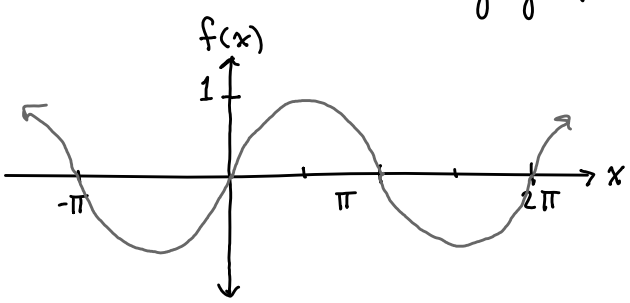
b) $\frac{1}{\text{Light}} - \frac{1}{\text{Saber}^2} + 5$ is $\text{Vader}^2 + \text{Vader} + 4$

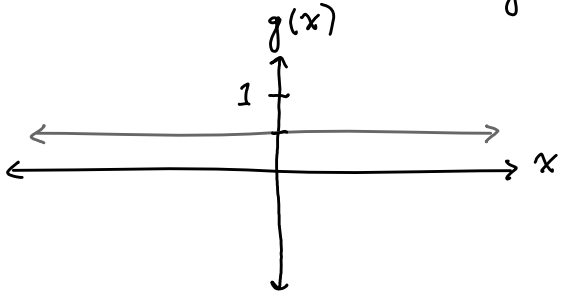
c) Anakin is $\text{Darth}^2 - \text{Vader}^2$

d) None of the above (are false)

e) All of the above (are false)

#7 Consider the following graphs of two functions $f(x)$ and $g(x)$.





Which of the following are true?

(X) If $f(x) = \sin(x)$ then $g(x) = \frac{1}{2}[f^2(x) + \cos^2(x)]$

(Y) If $f(x) = \sin(x)$ then $g(x) = \frac{1}{2}[f^2(2x) + \cos^2(2x)]$

(Z) If $f(x) = \sin(x)$ then $g(2x) = 1$

a) Only X and Y are true b) Only X is true c) Only X and Z are true

d) Only Y and Z are true e) X, Y, and Z are all true

#8 Consider the values a, b, c, α, β, and γ where a, b, and c are the lengths of the sides of a triangle and α, β, and γ are the angles opposite sides, a, b, and c, respectively.

Which of the following are true if $a = 1$ and $b = 2$.

a) If $\alpha = \pi/6$ the only triangle that fits the data is a right triangle.

b) If $0 < \alpha < \frac{\pi}{6}$ there are no triangles that fit the data.

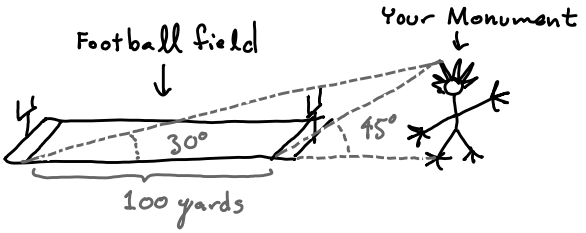
c) If $\alpha = \beta$ then $c = \sqrt{5}$ d) All of the above

e) None of the above

#9 Find the exact value of $\tan[2\sin^{-1}(-3/5) + \tan^{-1}(3/4)]$

a) Undefined b) $3/5$ c) $3/4$ d) $-3/4$ e) None of the above

#10 You have been awarded "Precalculus Student of the Universe" for the year. You have been given your own monument that stands in town square. You want to make sure your monument is taller than last year's "Precalculus Student of the Universe", so you need to measure the height of your monument. Near the monument is a football field. See the figure below. You use your trusty protractor to measure the angle of inclination to the top of the monument when standing at the zero yard line (end zone) at the closer end of the field find it to be about 45°. You do the same from the zero yard line at the other end of the field and find the angle of inclination to be about 30°. Luckily, the football field is oriented with the monument so that when you walk from the closer end zone to the other end zone, you walk directly away from the monument. Also, because your big sister is a professional football player, you know it's 100 yards from one end zone to the other. How tall is your monument in yards?



a) $\frac{100}{1+\sqrt{3}}$ b) $\frac{100}{\sqrt{3}-1}$ c) $\frac{100\sqrt{3}}{3}$

d) $\frac{100+\sqrt{3}}{2}$ e) None of the above