MS 133 EXAM 1C (Circa 1975) NAME _____

PART I (3 each) (39 Total) NO CALCULATORS!

1. If $y = 3x - 5$, give a) x intercept 1a) _____
   b) y intercept b) _____

2. If $y = x^2 - 5x - 6$, give a) x intercepts (5) 2a) _____
   b) y intercept (6) b) _____
   c) x coord of vertex c) _____
   d) y coord of vertex d) _____

3. Solve for x: $2x^2 - x = 3$ 3. _____

4. Solve for x: $2(x^2 - 1) + 2x - 5 = 0$. (simplify radical) 4. _____

5. If $y = \frac{x}{x^2 + 2x - 3}$, give the domain. 5. _____

6. Find distance between $(-5, -8)$ and $(5, 2)$. (Simp. radical) 6. _____

7. If $f(x) = x^2 - 4$ 7a) _____
   a) Find $f(-5)$. b _____
   b) Find $f(a + 4)$ and simplify. 8 _____

8. If $f(x) = -2x + 4$, find $f^{-1}(x)$

PART II (2 each) (28 total)

1. $\sin \pi/2 =$ _____
2. $\cos \pi/2 =$ _____
3. $\tan \pi/2 =$ _____
4. $\sin 3\pi/4 =$ _____
5. $\cos 3\pi/4 =$ _____
6. $\sin 7\pi/6 =$ _____
7. $\cos 2\pi/3 =$ _____
8. $\cot(-\frac{3\pi}{4}) =$ _____
9. $\sec \frac{11\pi}{6} =$ _____
10. $\csc(-\frac{5\pi}{4}) =$ _____
11. $\sin \frac{37\pi}{4} =$ _____
12. $\csc \pi =$ _____
13. $\tan 13\pi =$ _____
14. $\sin \frac{5\pi}{3} =$ _____

Thought for today: Be not conformed to this world: but be transformed by the renewing of your mind, that you may prove what is the good, and acceptable, and perfects will of God.
Romans 12:2

(over please!)

PART III. Give $\tilde{s}$ and quadrants "Q" *if* applicable, for partial credit. If *not* applicable, leave blank or write "quadrangle." Give all s, $0 \le s < 2\pi$

(3 each) (18 Total)

1. $\sin s = \frac{-1}{\sqrt{2}}$

   $\tilde{s} =$ ___ Q = ___

   $s =$ ___

2. $\cos s = \frac{\sqrt{3}}{2}$

   $\tilde{s} =$ ___ Q = ___

   $s =$ ___

3. $\tan s = -\sqrt{3}$

   $\tilde{s} =$ ___ Q = ___

   $s =$ ___

4. $\sec s = \sqrt{2}$

   $\tilde{s} =$ ___ Q = ___

   $s =$ ___.

5. $\csc s = -1$

   $\tilde{s} =$ ___ Q = ___

   $s =$ ___.

6. $\cot s$ is undefined

   $\tilde{s} =$ ___ Q = ___

   $s =$ ___.

PART IV. Use the given formulas as needed. *Show work on separate paper.*

(3 each) Total (15 points)

1. If $\cos s = -4/5$, and $\sin s < 0$, find $\tan s$ and $\sec s$.
2. If $\tan s = \sqrt{3}$, $\pi < s < \frac{3\pi}{2}$, find $\sin s$, $\cos s$, $\cot s$, $\sec s$ and $\csc s$.
3. Find $\cos\left(\frac{3\pi}{2} + s\right)$.
4. Using the fact that $\pi/12 = \frac{\pi}{3} - \frac{\pi}{4}$, find $\sin \pi/12$. Be sure answer is rationalized.
5. Show that $\cos 2s = 1 - 2\sin^2 s$. [Hint: Begin with $\cos(s+s)$ formula.]

E.C. (Show all work!) (4 each)

1. Given a $30°$-$60°$-$90°$ triangle with hypotenuse 1, explain thoroughly and/or derive the other sides.
2. If $\cos s = -8/17$, find $\cos 2s$.

MS 133 EXAM IC Solutions

1. $y = 3x - 5$
   a) $y = 0$ $x = \frac{5}{3}$
   b) $x = 0$ $y = -5$

2. $y = x^2 - 5x - 6$
   a) $y = 0$, $(x-6)(x+1) = 0$
   $x = 6, x = -1$
   b) $x = 0$, $y = -6$
   c) vertex $x = -\frac{b}{2a} = \frac{5}{2}$
   d) $y = \frac{25}{4} - \frac{25}{2} - 6$
   $= \frac{25}{4} - \frac{50}{4} - \frac{24}{4} = -\frac{49}{4}$

3. $2x^2 - x = 3$
   $2x^2 - x - 3 = 0$
   $(2x-3)(x+1) = 0$
   $x = \frac{3}{2}$ $x = -1$

4. $2(x^2 - 1) + 2x - 5 = 0$
   $2x^2 + 2x - 7 = 0$
   $x = \frac{-2 \pm \sqrt{4+56}}{2}$
   $= \frac{-2 \pm \sqrt{60}}{2} = \frac{-2 \pm 2\sqrt{15}}{2}$
   $= -1 \pm \sqrt{15}$

5. $y = \frac{x}{x^3 + 2x - 3}$
   Domain: $x^3 + 2x - 3 = 0$
   $(x+3)(x-1) = 0$
   $x = -3$ $x = 1$
   all $x \neq -3, 1$

6. $(-5, -8)$ $(6, 2)$
   $d = \sqrt{10^2 + 10^2}$
   $= \sqrt{200} = 10\sqrt{2}$

7. $f(x) = x^2 - 4$
   a) $f(-5) = 25 - 4 = 21$
   b) $f(a+4) = (a+4)^2 - 4$
   $= a^2 + 8a + 12$

PART II:

1. $\sin \frac{\pi}{2} = 1$
2. $\cos \frac{\pi}{2} = 0$
3. $\tan \frac{\pi}{2} =$ Undef. or ∞
4. $\sin \frac{3\pi}{4} = +\frac{\sqrt{2}}{2}$ or $+\frac{1}{\sqrt{2}}$
5. $\cos \frac{3\pi}{4} = -\frac{\sqrt{2}}{2}$ or $-\frac{1}{\sqrt{2}}$
6. $\sin \frac{7\pi}{6} = -\frac{1}{2}$
7. $\cos \frac{2\pi}{3} = -\frac{1}{2}$
8. $\cot(-\frac{3\pi}{4}) = 1$ (QIII)
9. $\sec \frac{11\pi}{6} = \frac{2}{\sqrt{3}}$
10. $\csc(-\frac{5\pi}{4}) = \sqrt{2}$
11. $\sin \frac{37\pi}{4} = \sin(9\pi + \frac{\pi}{4}) = -\frac{1}{\sqrt{2}}$ or $-\frac{\sqrt{2}}{2}$
12. $\csc \pi =$ Undef. or ∞
13. $\tan 13\pi = 0$
14. $\sin \frac{5\pi}{3} = -\frac{\sqrt{3}}{2}$

PART III.

1. $\sin \theta = -\frac{1}{\sqrt{2}}$
   $\tilde{\theta} = \frac{\pi}{4}$, QIII, IV.
   $\theta = \frac{5\pi}{4}, \frac{7\pi}{4}$

2. $\cos \theta = \frac{\sqrt{3}}{2}$
   $\tilde{\theta} = \frac{\pi}{6}$, Q = I IV
   $\theta = \frac{\pi}{6}, \frac{11\pi}{6}$

3. $\tan \theta = -\sqrt{3}$
   $\tilde{\theta} = \frac{\pi}{3}$ QII, IV.
   $\theta = \frac{2\pi}{3}, \frac{5\pi}{3}$

4. $\sec \theta = \sqrt{2}$
   $\tilde{\theta} = \frac{\pi}{4}$, Q = I, IV.
   $\theta = \frac{\pi}{4}, \frac{7\pi}{4}$

5. $\csc \theta = -1$
   $\sin \theta = -1$
   $\theta = \frac{3\pi}{2}$
   (Quadrangle)

6. $\cot \theta =$ Undef
   $\frac{\cos\theta}{\sin\theta} = \infty$
   $\sin \theta = 0$
   $\theta = 0, \pi,$
   (Quadrangle)

PART IV.

1. $\cos \theta = -4/5$ and $\sin \theta < 0$,
   $\sin^2\theta + \cos^2\theta = 1$
   $16/25 + \sin^2\theta = 1$
   $\sin^2\theta = 9/25$
   $\sin\theta = -3/5$
   $\tan \theta = 3/4$
   $\sec \theta = -5/4$

2. $\tan \theta = \sqrt{3}$
   $\pi < \theta < \frac{3\pi}{2}$ = QIII.
   $\theta = \frac{4\pi}{3}$
   $\sin\theta = -\frac{\sqrt{3}}{2}$
   $\cos\theta = -1/2$
   $\cot\theta = 1/\sqrt{3}$
   $\sec\theta = -2$
   $\csc\theta = -2/\sqrt{3}$

3. $\cos(\frac{3\pi}{2} + \theta) = \cos\frac{3\pi}{2}\cos\theta - \sin\frac{3\pi}{2}\sin\theta$
   $= 0 - (-1)\sin\theta$
   $= \boxed{\sin\theta}$

4. $\sin\frac{\pi}{12} = \sin(\frac{\pi}{3} - \frac{\pi}{4}) = \sin\frac{\pi}{3}\cos\frac{\pi}{4} - \sin\frac{\pi}{4}\cos\frac{\pi}{3}$
   $= \frac{\sqrt{3}}{2}\cdot\frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{2}\cdot\frac{1}{2} = \boxed{\frac{\sqrt{6} - \sqrt{2}}{4}}$

5. $\cos 2\theta = \cos(\theta + \theta)$
   $= \cos\theta\cos\theta - \sin\theta\sin\theta$
   $= \cos^2\theta - \sin^2\theta$
   $= 1 - \sin^2\theta - \sin^2\theta$
   $= \boxed{1 - 2\sin^2\theta}$

Use:
$\cos^2\theta + \sin^2\theta = 1$
$\cos^2\theta = 1 - \sin^2\theta$