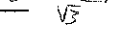
BACKGROUND KNOWLEDGE FOR CALCULUS

1. Area of a square with side s: $A = s^2$
2. Area of a rectangle with width w and length l: $A = lw$
3. Area of a right triangle with base b and height h: $A = \frac{bh}{2}$
4. Area of a circle with radius r: $A = \pi r^2$
5. Circumference of a circle with radius r: $C = 2\pi r$
6. Volume of a box with with w, length l and height h: $V = lwh$
7. Volume of a cylinder (i.e., a can) with radius r and height h: $V = \pi r^2 h$
8. Surface area of a cylinder with radius r and height h: $2\pi rh + 2\pi r^2$
9. Pythagorean Theorem: $h = \sqrt{a^2 + b^2}$
10. Diagonal of a square with side s:  $d = s\sqrt{2}$
11. Side of a square with diagonal d: $s = \frac{d}{\sqrt{2}}$
12. Quadratic formula (to find roots of $ax^2 + bx + c = 0$): $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
13. Expansion of $(a + b)^2$: $a^2 + 2ab + b^2$
14. Expansion of $(a - b)^2$: $a^2 - 2ab + b^2$
15. Definition of $\sin\alpha$ in terms of sides of a triangle: opp/hyp
16. Definition of $\cos\alpha$ in terms of sides of a triangle: adj/hyp
17. Definition of $\tan\alpha$ in terms of sides of a triangle: opp/adj.
18. The values of $\sin\alpha$, $\cos\alpha$, $\tan\alpha$, if α is $30° = \pi/6$: $\frac{1}{2}$, $\frac{\sqrt{3}}{2}$, $\frac{1}{\sqrt{3}}$ 
19. The values of $\sin\alpha$, $\cos\alpha$, $\tan\alpha$, if α is $60° = \pi/3$: $\frac{\sqrt{3}}{2}$, $\frac{1}{2}$, $\sqrt{3}$
20. The values of $\sin\alpha$, $\cos\alpha$, $\tan\alpha$, if α is $45° = \pi/4$: $\frac{1}{\sqrt{2}}$, $\frac{1}{\sqrt{2}}$, 1
21. The values of $\sin\alpha$, $\cos\alpha$, $\tan\alpha$, if α is $0°$: 0 1 0
22. The values of $\sin\alpha$, $\cos\alpha$, $\tan\alpha$, if α is $90° = \pi/2$: 1 0 ∞
23. The values of $\sin\alpha$, $\cos\alpha$, $\tan\alpha$, if α is $180° = \pi$: 0 -1 0
24. True or False?: $\sqrt{a^2 + b^2} = a + b$. Why (not) (i.e., prove or give a counter-example)?

False NO $\sqrt{1+1} = \sqrt{2}$ $\sqrt{1} + \sqrt{1} = 1 + 1 = 2$

25. What is $\sin 2x$ in terms of trig functions of x? $\sin 2x = 2\sin x \cos x$
26. What is $\sin^2 x$ in terms of trig functions of $2x$? $\sin^2 x = \frac{1 - \cos 2x}{2}$

27. What is $\cos^2 x$ in terms of trig functions of $2x$? $\cos^2 x = \frac{1+\cos 2x}{2}$

28. What is the standard trig version of the pythagorean theorem (i.e., inter-relate $\sin x$ and $\cos x$ somehow)? $\sin^2 x + \cos^2 x = 1$

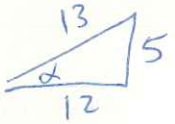
29. Given $\sin\alpha = 5/13$. what is $\cot\alpha$? $12/5$

30. Given $\sin\alpha = 4/5$, what is $\sin 2\alpha$.? $24/25$

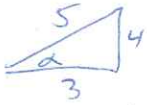
31. Calculate the area of a circle, given that the circumference equals 10π. 25π

32. Calculate the area of a right triangle, with one side equaling 3 and the hypotenuse equaling 5. 6

29 $\sin\alpha = \frac{5}{13}$



30 $\sin\alpha = 4/5$



$\sin 2\alpha = 2\sin\alpha\cos\alpha$

$= 2 \cdot \frac{4}{5} \cdot \frac{3}{5}$

$= \frac{24}{25}$

31. $C = 10\pi = 2\pi r$

$r = 5$

$A = \pi r^2 = 25\pi$

32. $A = \frac{bh}{2}$

$= \frac{3 \cdot 4}{2} = \frac{12}{2} = 6$