Worksheet 0: ALGEBRA & TRIG PRACTICE NAME:________________________

The following questions cover prerequisite material that is pertinent to the material in Calculus I. The questions are in no particular order and you may attack them in any order you please. You may work together. (Note that this worksheet gives you an idea of how I write exam questions!)

1. Solve the inequality $\frac{4x+1}{x-5} \leq 3$ for x.
2. If $x^2 - 5x + 3 = 0$ is solved for x by completing the square, then during the process one finds that $x^2 - 5x + \left(\frac{-5}{2}\right)^2$ equals

   (a) $-3 + \left(\frac{-5}{2}\right)^2$ (b) $3 + \left(\frac{-5}{2}\right)^2$ (c) $\left(\frac{-5}{2}\right)^2$ (d) none of these.
3. Solve $k = \frac{1}{2}mv^2$ for m where m, v, k are nonzero.
4. Let $f(x) = x^2 - 3$ on the interval $[0, \infty)$. On a suitable domain, the inverse function f^{-1} of f is

   (a) $f^{-1}(y) = \pm\sqrt{y+3}$ (b) $f^{-1}(y) = -\sqrt{y+3}$ (c) $f^{-1}(y) = \sqrt{y+3}$ (d) none of these.
5. Find the equation of the line passing through the points $(-2/3, 0)$ and $(0, 7/2)$.
6. Solve $2^{3x+4} = 3^{2x+1}$ for x.
7. Find the zeros of $-3x^2e^{-2x} + 3xe^{-2x}$.
8. Solve $\log_7(2x+3) = \log_7 11 + \log_7 3$ for x.
9. Solve the system $\left.\begin{array}{rcrcr} x^2 & + & 2y & = & 30 \\ 2x & + & y & = & 15 \end{array}\right\}$ for (x, y).
10. Find the exact value of $\cos\theta$ when $\sin\theta = -3/5$ and $\tan\theta > 0$.
11. Solve the equation $2\sin^2 t - \cos t - 1 = 0$ for t in radians.
12. $\sin^{-1}(\sin 9\pi/10)$ equals (a) $\pi/10$ (b) $9\pi/10$ (c) $-\pi/10$ (d) $11\pi/10$.
13. The expression $\sin 12\theta$ is identical to

    (a) $12\sin\theta\cos\theta$ (b) $\sin 6\theta\cos 6\theta$ (c) $6\sin 2\theta\cos 2\theta$ (d) $4\sin 3\theta\cos 3\theta\cos 6\theta$.
14. Assuming $x, y, z > 0$, simplify the expression $\sqrt[3]{16x^3y^8z^4}$.
15. If $f(x) = \sqrt{x}$ and $g(x) = x^4 - 9$, find the domain of $g \circ f$.
16. If $f(x) = \frac{4x+1}{7}$ and $g(x) = \sqrt{x}$, where $x \geq 0$, find $(f \circ g)(x)$.
17. If $h(2) = 3$, $h(5) = 6$, $p(3) = 4$ and $p(2) = 5$, find $(p \circ h)(2)$.
18. If $f(x) = \frac{1}{x+3}$, find $f^{-1}(x)$.
19. Solve $y = \frac{e^x - e^{-x}}{e^x + e^{-x}}$ for x in terms of y.
20. $(3y^{\frac{5}{6}})(8y^{\frac{2}{3}})$ equals (a) $24y^{\frac{5}{9}}$ (b) $24y^{\frac{2}{3}}$ (c) $24y^{\frac{3}{2}}$ (d) none of these.

21. $\left(\dfrac{-8a^3}{a^{-6}}\right)^{\frac{2}{3}}$ equals (a)$4a^6$ (b)$64a^{-2}$ (c)$2a^{\frac{27}{2}}$ (d) none of these.

22. $a^6 - b^6$ equals (a) $(a^3 - b^3)^2$ (b) $(a^2 - b^2)^3$ (c)$(a - b)^6$ (d) none of these.

23. $\dfrac{\frac{1}{x+h} - \frac{1}{x}}{h}$ equals (a) $\dfrac{1}{x(x+h)}$ (b) $-\dfrac{1}{x(x+h)}$ (c) $\dfrac{1}{xh(x+h)}$ (d) none of these.

24. $\dfrac{\sqrt{t}+5}{\sqrt{t}-5}$ equals (a)$\dfrac{t+10\sqrt{t}+25}{t-25}$ (b)$\dfrac{t+10\sqrt{t}+25}{t+25}$ (c)$\dfrac{t+25}{t-25}$ (d) none of these.

25. Solve $|3x - 2| + 3 = 7$ for $x \in \mathbb{R}$.

26. Solve $\sqrt{7 - 5x} = 8$ for $x \in \mathbb{R}$.

27. Solve $A = 2\pi x(x + h)$ for x.

28. Express $\log\left(\dfrac{x^2}{y^3}\right) + 5\log y - 6\log\sqrt{xy}$ as one logarithm.

29. Solve $2^{5x+3} = 3^{2x+1}$ for $x \in \mathbb{R}$.

30. Solve $e^{\ln(x+1)} = 3$ for $x \in \mathbb{R}$.

31. Solve $e^x + 2 = 8e^{-x}$ for $x \in \mathbb{R}$.

32. Find $\sin\theta$ and $\cos\theta$ as precise fractions given that $\theta \in [0, \pi/2)$ and $\tan\theta = 14/11$.

33. Find all solutions θ exactly in radians to the equation $\sqrt{3} - \tan 3\theta = 0$.

34. Find all solutions θ exactly in radians to the equation $\sin 2\theta = \sin\theta$.

35. Find the point of intersection of the graphs of the equations $\left\{\begin{array}{rcl} x + 2y & = & 10^{1024} \\ 2x + y & = & 2 \cdot 10^{1023}. \end{array}\right.$

    (a) $(2\cdot10^{1023}, 6\cdot10^{1023})$ (b) $(2\cdot10^{1023}, -6\cdot10^{1023})$ (c) $(-2\cdot10^{1023}, 6\cdot10^{1023})$ (d) there are no intersection points.

36. Find the points of intersection of the graphs of the equations $\left\{\begin{array}{rcl} x^2 + y^2 & = & 7500 \\ 2x + y & = & 100. \end{array}\right.$

    (a) $(40 + \sqrt{1101}, 20 - 2\sqrt{1101})$ and $(40 - \sqrt{1101}, 20 + 2\sqrt{1101})$

    (b) $(10(4 + \sqrt{11}), 20(1 - \sqrt{11}))$ and $(10(4 - \sqrt{11}), 20(1 + \sqrt{11}))$

    (c) $(73.2, -46.3)$ and $(6.8, 86.3)$ (d) there are no intersection points.

37. All lines parallel to the line $3x - 8y = 4$ are given by equations of the form
    (a) $3x - 8y = 0$ (b) $3x - 8y = c$, $c =$ constant (c) $8x - 3y = c$, $c =$ constant (d) none of these.