Name _____ Period _____ Date _____

AP Calculus AB Review Session #0A: *PreCalculus Review*

Please complete the following items without the use of a calculator, except where explicitly noted.

1. Simplify:

   a) $\dfrac{x^3 - 9x}{x^2 - 7x + 12}$

   b) $\dfrac{x^2 - 2x - 8}{x^3 + x^2 - 2x}$

   c) $\dfrac{\dfrac{1}{x} - \dfrac{1}{5}}{\dfrac{1}{x^2} - \dfrac{1}{25}}$

   d) $\dfrac{9 - x^{-2}}{3 + x^{-1}}$

2. Solve for x (*no calculators!*):

   a) $5^{x+1} = 25$

   b) $\dfrac{1}{3} = 3^{2x+2}$

   c) $\log_3 x^2 = 2\log_3 4 - 4\log_3 5$

3. Solve the following equations for the indicated variables:

   a) $\dfrac{x}{a} + \dfrac{y}{b} + \dfrac{z}{c} = 1$, for a

   b) $V = 2(ab + bc + ca)$, for a

   c) $A = 2\pi r^2 + 2\pi rh$, for positive r

   d) $A = P + nrP$, for P

   e) $2x - 2yd = y + xd$, for d

   f) $\dfrac{2x}{4\pi} + \dfrac{1-x}{2} = 0$, for x
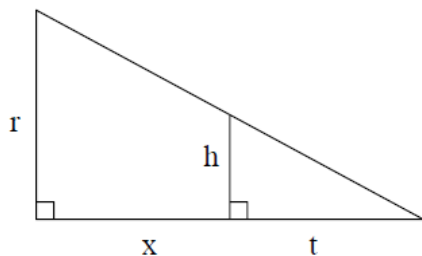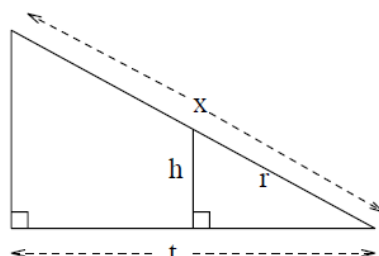
4. Find the equations of the following:

   a) the line through $(-1,3)$ and $(2,4)$

   b) the line through $(-1,2)$ and perpendicular to the line $2x - 3y + 5 = 0$

5. Solve for x, in terms of the other variables, in each of the diagrams below.

(a)   (b)

6. A water tank has the shape of a cone (like an ice cream cone without ice cream). The tank is 10 meters high and has a radius of 3 meters at the top. If the water is 5 meters deep (in the middle) what is the surface area of the top of the water?

7. Two cars start moving from the same point. One travels south at 100 kilometers per hour, the other west at 50 kilometers per hour. How far apart are they two hours later?

8. A kite is 100 meters above the ground. If there are 200 meters of string out, what is the angle between the string and the horizontal. (Assume that the string is perfectly straight.)

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9. If $f(x) = \dfrac{4}{x-1}$ and $g(x) = 2x$, then the solution set of $f(g(x)) = g(f(x))$ is

(A) $\left\{\dfrac{1}{3}\right\}$ (B) $\{2\}$ (C) $\{3\}$ (D) $\{-1,2\}$ (E) $\left\{\dfrac{1}{3},2\right\}$

10. If the function f is defined by $f(x) = x^5 - 1$, then f^{-1}, the inverse function of f, is defined by
$f^{-1}(x) =$

(A) $\dfrac{1}{\sqrt[5]{x}+1}$ (B) $\dfrac{1}{\sqrt[5]{x+1}}$ (C) $\sqrt[5]{x-1}$

(D) $\sqrt[5]{x}-1$ (E) $\sqrt[5]{x+1}$

11. For each of the functions below, identify any vertical asymptote(s), horizontal asymptote(s), zero(s), hole(s). Also, identify the y-intercept of each function.

(a) $y = \dfrac{3x}{x-6}$ (c) $y = \dfrac{2x^2-18}{5x^2+10x-15}$

(b) $y = \dfrac{x^2}{x^2-25}$ (d) $y = \dfrac{2x-2}{5x^2+10x-15}$

12. *Without a calculator*, identify the solution to each inequality.

(a) $-2(x+5)(x-1)(x-7) > 0$ (e) $-4(x+5)^2(x-3)^2 \geq 0$

(b) $-4x(x+6)(x+1)(x-7) \leq 0$ (f) $\dfrac{2}{3}x(x+5)^2 \geq 0$

(c) $\dfrac{5}{6}(x+3)^2(x-2)(x-5) \geq 0$ (g) $(x+5)(5x+3) < 0$

(d) $5(x+8)(4x-3)(x-9) < 0$

13. Without a calculator, evaluate each expression:

(a) $\log_2 128$

(b) $\log_2\left(\dfrac{1}{128}\right)$ (d) $\log_{128}\left(\dfrac{1}{2}\right)$

(c) $\log_{128} 2$ (e) $\log_{81}\left(\dfrac{1}{27}\right)$

14. Factor each of the following expressions:

(a) $3p^2 - 13p - 10$ (d) $121h^2 - 144$

(b) $4q^2 + 7q - 15$ (e) $50x^2 - 72$

(c) $10u^2 - 19u - 15$ (f) $-6x^3 + 39x^2 - 63x$