

ARE YOU READY FOR CALCULUS

- 1.) Simplify: a.)  $\frac{x^3-9x}{x^2-7x+12}$     b.)  $\frac{x^2-2x-8}{x^3+x^2-2x}$     c.)  $\frac{\frac{1}{x}-\frac{1}{5}}{\frac{1}{x^2}-\frac{1}{25}}$     d.)  $\frac{9-x^{-2}}{3+x^{-1}}$
- 2.) Rationalize the denominator:  
a.)  $\frac{2}{\sqrt{3}+\sqrt{2}}$     b.)  $\frac{4}{1-\sqrt{5}}$
- 3.) Write each of the following expressions in the form  $ca^p b^q$  where c, p, and q are real numbers:  
a.)  $\frac{(2a^2)^3}{b}$     b.)  $\sqrt{9ab^3}$     c.)  $\frac{a(\frac{2}{b})}{\frac{3}{a}}$     d.)  $\frac{ab-a}{b^2-b}$     e.)  $\frac{a^{-1}}{(b^{-1})\sqrt{a}}$     f.)  $\left(\frac{a^{2/3}}{b^{1/2}}\right)^2 \left(\frac{b^{3/2}}{a^{1/2}}\right)$
- 4.) Solve for  $x$  (to be done without a calculator):  
a.)  $5^{(x+1)} = 25$     b.)  $\frac{1}{3} = 3^{2x+2}$     c.)  $\log_2 x = 3$     d.)  $\log_3 x^2 = 2 \log_3 4 - 4 \log_3 5$
- 5.) Simplify:  
a.)  $\log_2 5 + \log_2(x^2 - 1) - \log_2(x - 1)$     b.)  $2 \log_4 9 - \log_2 3$     c.)  $3^{2 \log_3 5}$
- 6.) Simplify:  
a.)  $\log(10^{1/2})$     b.)  $\log\left(\frac{1}{10^x}\right)$     c.)  $2 \log \sqrt{x} + 3 \log x^{1/3}$
- 7.) Solve the following equations for the indicated variables:  
a.)  $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$ , 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.)  $\frac{2x}{4\pi} + \frac{1-x}{2} = 0$ , for  $x$
- 8.) For the equations, complete the square and reduce to one of the standard forms:  
 $y - b = A(x - a)^2$  or  $x - a = A(y - b)^2$   
a.)  $y = x^2 + 4x + 3$     b.)  $3x^2 + 3x + 2y = 0$
- 9.) Factor completely:  
a.)  $x^6 - 16x^4$     b.)  $4x^3 - 8x^2 - 25x + 50$     c.)  $8x^3 + 27$     d.)  $x^4 - 1$
- 10.) Find all real solutions to:  
a.)  $x^6 - 16x^4 = 0$     b.)  $4x^3 - 8x^2 - 25x + 50 = 0$     c.)  $8x^3 + 27 = 0$
- 11.) Solve for  $x$ :  
a.)  $3 \sin^2 x = \cos^2 x$   $[0, 2\pi]$     b.)  $\cos^2 x - \sin^2 x = \sin x$   $(-\pi, \pi]$

- 12.) Without a calculator, evaluate the following:
- a.)  $\cos 210^\circ$       b.)  $\sin \frac{5\pi}{4}$       c.)  $\tan^{-1}(-1)$       d.)  $\sin^{-1}(-1)$   
e.)  $\cos \frac{9\pi}{4}$       f.)  $\sin^{-1}\left(\frac{\sqrt{3}}{2}\right)$       g.)  $\tan \frac{7\pi}{6}$       h.)  $\cos^{-1}\left(\frac{1}{2}\right)$
- 13.) Solve the equations:
- a.)  $4x^2 + 12x + 3 = 0$       b.)  $2x + 1 = \frac{5}{x+2}$       c.)  $\frac{x+1}{x} - \frac{x}{x+1} = 0$
- 14.) Find the remainders on division of:
- a.)  $x^5 - 4x^4 + x^3 - 7x + 1$  by  $x + 2$   
b.)  $x^5 - x^4 + x^3 + 2x^2 - x + 4$  by  $x^3 + 1$
- 15.) The equation  $12x^3 - 23x^2 - 3x + 2 = 0$  has a solution  $x = 2$ . Find all other solutions.
- 16.) Solve for  $x$ , the equation  $12x^3 + 8x^2 - x - 1 = 0$  (All solutions are rational & between  $\pm 1$ .)
- 17.) Solve the inequalities:
- a.)  $x^2 + 2x - 3 \leq 0$       b.)  $\frac{2x-1}{3x-2} \leq 1$
- 18.) Solve for  $x$ :
- a.)  $|-x + 4| \leq 1$       b.)  $|5x - 2| = 8$       c.)  $|2x + 1| = x + 3$
- 19.) Determine the equations of the following lines:
- a.) the line through  $(-1,3)$  and  $(2,4)$   
b.) the line through  $(-1,2)$  and perpendicular to the line  $2x - 3y + 5 = 0$   
c.) the line through  $(2,3)$  and the midpoint of the line segment from  $(-1,4)$  to  $(3,2)$ .
- 20.) Find the point of intersection of the lines:  $3x - y - 7 = 0$  and  $x + 5y + 3 = 0$
- 21.) Graph and shade the region in the  $x$ - $y$  plane that is described by the inequalities. (Should be done without the aid of a calculator.)
- $$\begin{cases} 3x - y - 7 < 0 \\ x + 5y + 3 \geq 0 \end{cases}$$
- 22.) Find the domain of the function  $f(x) = \frac{(3x+1)}{\sqrt{x^2+x-2}}$
- 23.) Find the domain and range of the functions:
- a.)  $f(x) = 7$       b.)  $g(x) = \frac{5x-3}{2x+1}$
- 24.) Simplify  $\frac{f(x+h)-f(x)}{h}$ , where a.)  $f(x) = 2x + 3$       b.)  $f(x) = \frac{1}{x+1}$       c.)  $f(x) = x^2$
- 25.) Sketch the graphs of the functions WITHOUT the aid of a graphing device:
- a.)  $g(x) = |3x + 2|$       b.)  $h(x) = |x(x - 1)|$
- 26.) Find the inverse of the functions:
- a.)  $f(x) = 2x + 3$       b.)  $f(x) = \frac{x+2}{5x-1}$