

side of each page only

4.)  $\lim_{x \rightarrow 7} x^2 - \frac{7}{x} = ?$  2.) if  $y = (x^2 + 1)^{100} (x + x^{-1})^{17}$  find  $y'$ .

3.)  $\int x^{100} + 3x^{1/2} + x^{-3} + 6x + 7 dx = ?$

4.) Find  $dz/dt$  if  $z = \frac{t^2 + t + 1}{t^2 - t + 2}$  5.)  $\lim_{x \rightarrow 2} \frac{x^2 - x - 2}{x^2 - 4} = ?$

6.)  $\lim_{x \rightarrow 3} \frac{x^2 - 5x + 6}{\sqrt{x} - \sqrt{3}} = ?$  7.)  $\lim_{x \rightarrow \infty} \frac{10x^2 + x - 1/2}{-5x^2 + 1/x} = ?$

8.)  $\lim_{x \rightarrow 0^+} -1/\sqrt{x} = ?$  9.)  $\int_1^3 x^2 + 2x dx = ?$

10.) Implicitly find  $dy/dx$  if  $x^4 + x^3y + x^2y^2 = 1$ .

11.) If  $\epsilon$  is a nonzero infinitesimal find the standard part of  $\frac{1}{\epsilon} (\frac{1}{2+\epsilon} - \frac{1}{2})$

12.) Use the differential to approximate  $(8.1)^2$

13.) If the velocity is given by  $v(t) = 2t + 2$ , find the acceleration  $a(t)$  & the position  $s(t)$  if  $s(2) = 1$ .

14.) Find the equation of the tangent line to the curve  $f(x) = x^2 + x + 2$  that passes through the point  $(2, 8)$ .

15.) Find the min & max values of  $f(x) = 3x^4 - 20x^3 + 36x^2$  on  $[1, 3]$

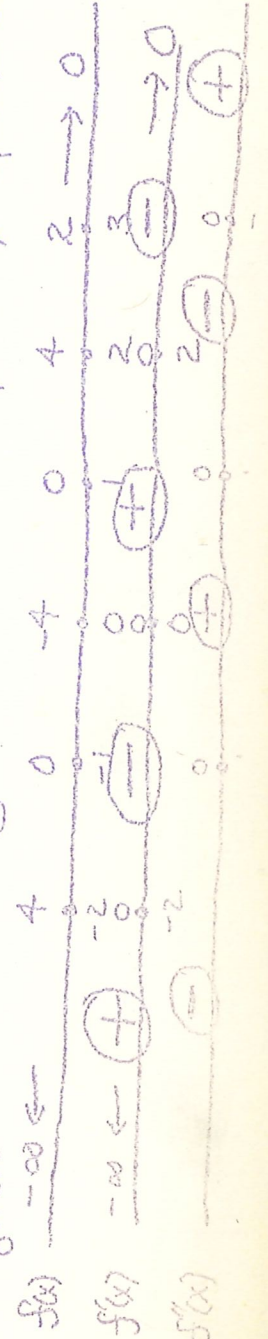
16.) Since  $\lim_{x \rightarrow 1/2} \frac{1}{x} = 2$  Find  $\delta$  that works for  $\epsilon = 1$  that is find  $\delta > 0$  so that  $|x - 1/2| < \delta \implies |1/x - 2| < \epsilon = 1$ .

17.) Find where  $f(x)$  is zero, positive ( $> 0$ ) & negative ( $< 0$ ) when  $f(x) = \frac{1}{2}x(x^2 - 1)(x - 2)(2 + x)(x - 3)^3$ .

18.) If  $x$  &  $y$  are positive reals with average  $A$  ( $A = \text{constant}$ ) maximize  $\sqrt{xy}$ . [Extra Credit; use this to show  $x > 0, y > 0 \implies \sqrt{xy} \leq \frac{x+y}{2}$ ]

19.) (The Snowball That Devoured Cleveland Problem) A spherical snowball is growing in volume at the rate of 1000 cubic miles per day. How fast is the radius increasing when the radius = 10 miles [Hint: Volume of sphere = four-thirds pi times radius cubed.]

20.) Graph  $f(x)$ , pointing out all local mins & maxs & all points of inflection, given

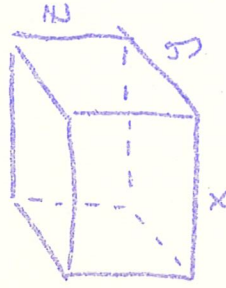


1. If  $f(x) = x^2 - x + 1$ , find  $df(x, h)$ ,  
 2. If  $y = (x+x^{-1})(x^2+x^{-2})^{-1}$  and  $x = t(t+1)^2$  find  $\frac{dy}{dt}$ .

In 3 and 4 use the differential to approximate  
 (we like in Homework) 3.  $\sqrt{.98}$  4.  $(1.02)^{-1}$

5. Find the minimum value and maximum value of  
 $f(x) = x + x^{-1}$  on  $[\frac{1}{10}, 10]$ .

6. Find all relative minimums, relative maximums and  
 points of inflection of  $f(x) = x^3 - 3x + 7$



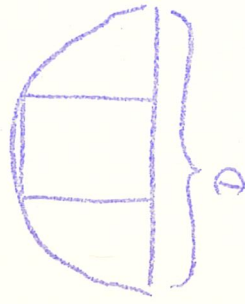
A box has sides  $x, y,$  and  $z$

Find the rate of change of the  
 Volume of the box when

$x = 10, y = 3, z = 6$  if  $\frac{dx}{dt} = \frac{5}{3}, \frac{dy}{dt} = -1, \frac{dz}{dt} = 1$

8. For  $f(x) = \frac{(1-x)(x-2)^2(x-3)}{(x^2+1)^3}$  find all  $x$   
 for which  $f(x) > 0; f(x) < 0$ .

9.



Find the rectangle of maximum  
 area that can be inscribed in  
 a semi-circle with diameter  $D$ ,  
 (what are the dimensions?)  
 HINT: IT IS NOT A SQUARE.

10. GRAPH  $f(x)$  given:  $f(-1) = -2, f(0) = 0, f(1) = 2$   
 $\lim_{x \rightarrow +\infty} f(x) = 0 = \lim_{x \rightarrow -\infty} f(x), f'(-1) = 0 = f'(1)$

$f' > 0$  for  $-1 < x < 1; f' < 0$  for  $x < -1$  or  $1 < x$   
 $f'' > 0$  for  $-2 < x < 0$  or  $2 < x$        $f''(-2) = 0$   
 $f'' < 0$  for  $x < -2$  or  $0 < x < 2$        $f''(0) = 0$        $f''(2) = 0$