[10pts] 1. Find the domain D of the function. (Write answer in interval notation.)

$$f(x) = \frac{x-1}{x^2+5x-6}$$

$D =$

[8 pts] 2. Find all solutions of $\cos(2t) = -1$

$t =$

[16 pts] 3. Find the following limit. If the limit doesn't exist, write 'DNE'

(a) $\lim_{x\to 4}\frac{16-x^2}{4-x}$

(b) $\lim_{x\to 3}\frac{x+3}{x-3}$

[9 pts] 4. Find the value of c, such that function

$$f(x)=\begin{cases}\dfrac{c-2}{x}, & if \quad x\le -1\\ x+2c, & if \quad x>-1\end{cases}$$

is continuous at $x=-1$.

c=

[8 pts]5. Let $f(x)=\frac{1}{x-1}$, find $f'(x)$ by using $\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$

$f'(x)=$

[8 pts]6. Find an equation of the tangent line to the graph of $f(x)=x^2+1$ at the point $(1,\ 2)$.

Equation is:

7. Find the derivative of functions by using the rules of differentiation.

[8pts] (a) $f(x) = \frac{3}{x^3} - \frac{x^3}{3}$

$f'(x) =$

[8pts] (b) $g(x) = \frac{2}{\sqrt{x}} + \sin x$

$g'(x) =$

8. A hot-air balloon rises vertically from the ground so that its height after t sec is $h(t) = \frac{1}{3}t^3 + 3t$ ft $(0 \le t \le 10)$.

[5 pts]

(a) What is the average velocity of the balloon between t=1 and t=3 ?

[5 pts]

(b) What is the instantaneous velocity of the balloon at the end of 3 sec ?

9. Growth Rate. The population of a city grows from an initial size of $10{,}000$ to an amount P, given by $P(t) = 10{,}000 + 50t^2$, where t is in years.

[5pts](a) Find the growth rate of P with respect to t.

[5pts](b) Find the number of people in the city after 20 years (at $t = 20$).

[5pts](c) Find the growth rate at $t = 20$.