Name

Each problem is worth 10 points.

1. Find $\lim_{x\to 0} \dfrac{\sin(x^2+x)}{x}$. Show your work. Encircle correct answer:

   $a)1 \quad b)0 \quad c)\infty \quad d)-\infty \quad e)2 \quad f)$ none of the previous

2. Given $f(x)$, indicate which is $f'(x)$. You must show valid work.

   (a) $f(x) = \sin(x^2)$

   $i)\cos(x^2) \quad ii)2x\cos(x^2) \quad iii)2\sin x\cos x \quad iv)2\cos 2x \quad v)2\sin 2x \quad vi)$ none of the previous

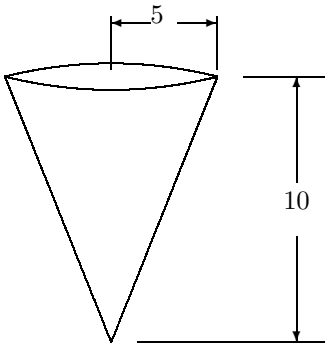
   (b) $f(x) = \sin^2 x$

   $i)\cos(x^2) \quad ii)2x\cos(x^2) \quad iii)2\sin x\cos x \quad iv)2\cos 2x \quad v)2\sin 2x \quad vi)$ none of the previous

3. Given $f(x) = \sin(\cos x)$, indicate which is $f'(x)$. Show work.

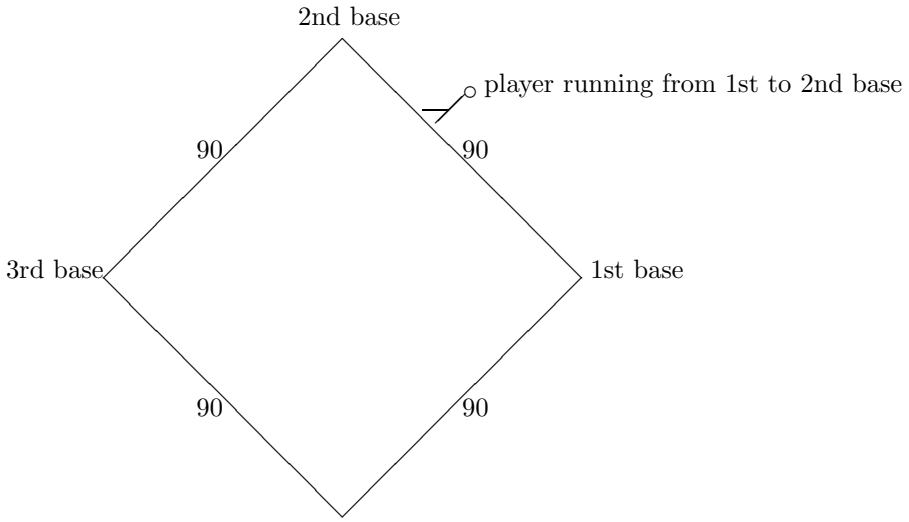
   $a)-\cos(x^2) \quad b)-\sin x\cos(\cos x) \quad c)-\cos^2 x\sin x \quad d)2\cos 2x \quad e)2\sin 2x \quad f)$ none of the previous

4. Water runs into a conical tank at the rate of 9 cubic ft/min. The tank stands point down and has a height of 10 ft and a base radius of 5 ft. How fast is the water level rising when the water is 6 ft deep? Show work.



Answer=

5. A baseball diamond is a square 90 ft on a side. A player runs from first base to second at a rate of 16 ft/sec. At what rate is the player's distance from third base changing when the player is 30 ft from first base? Show work in blue book.



Answer=

6. Find the tangent line and normal line to the curve at $(-1, 2)$ where $x^2 - xy + y^2 = 7$. Show all work.

tangent line: $y =$

normal line: $y =$

7. State the Mean Value Theorem:

8. Find the value or values of c that satisfy the equation given in the Mean Value Theorem. Show work.

$$f(x) = (x-1)^{1/3} \text{ on } [1,9]$$

c=

9. List all intervals where $f(x) = x^4 - 4x^2 + 4$ is increasing, decreasing, concave up, concave down. Show work.

f is increasing on

f is decreasing on

f is concave up on

f is concave down on

10. Find y'' at $x = -1, \quad y = 1, \quad$ given $x^2 - xy + y^2 = 3$. Show all work.

Answer $y'' =$