1.

Let $g(x) = \frac{x}{\sqrt{2-x^2}}$ [3 points]

a) Find $g'(x)$ and simplify it to match one of the following choices (show all of your work!):

(i) $g'(x) = \frac{2}{(2-x^2)^{3/2}}$ (ii) $g'(x) = \frac{-1}{2(2-x^2)^{3/2}}$ (iii) $g'(x) = \frac{-x^2-\frac{1}{2}x+2}{(2-x^2)^{3/2}}$

b) For what value(s) of x is the tangent line to the curve g(x) horizontal?

$$g' = \frac{\sqrt{2-x^2}(1) - \frac{1}{2}(2-x^2)^{-1/2}(-2x)(x)}{2-x^2} = \frac{(2-x^2)^{1/2} + \frac{x^2}{(2-x^2)^{1/2}}}{2-x^2}$$

Get cd.

$$\frac{2}{(2-x^2)^2} \cdot \frac{1}{(2-x^2)} \qquad \frac{2-x^2+x^2}{(2-x^2)^{1/2}}$$

$$\boxed{g' = \frac{2}{(2-x^2)^{3/2}}}$$

2. $f(x) = f(x) = \begin{cases} cx + d, & x \le 2 \\ x^2 - cx, & x > 2 \end{cases}$ where c and d are constants.

If f is differentiable at x=2. What is the value of $c + d$

$$\lim_{x \to 2^-} f'(x) \quad c = \lim_{x \to 2^+} f'(x) \; 2x - c$$

$c = 2x - c$

$+c \quad +c$

$2c = 2(2)$

$c = 2$

$\lim_{x \to 2} f(x)$

$2(2) + d = 4 - 4$

$4 + d = 0$

$d = -4$

$c + d =$
$2 + -4 = -2$

3. Find $\frac{dy}{dx}$ *for the curve* $y = \frac{2^{\sin x}}{cosx}$

$u = \sin x$
$du = \cos x$

$$\frac{2^u}{\cos x}$$

a) $-2^{\sin x} \ln 2 \cot x$

b) $2^{\sin x} \ln 2 \cos x \sec x \tan x$

c) $-2^{\sin x} \ln 2 \tan x$

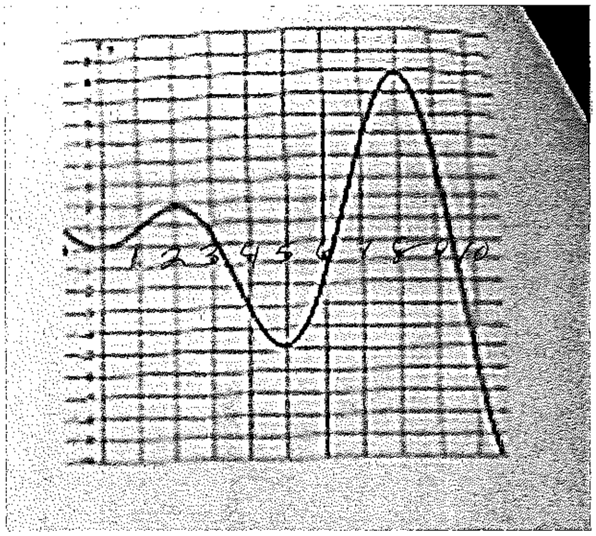
d) $2^{\sin x}\left(\ln 2 + \frac{\sin x}{\cos^2 x}\right)$

e) $2^{\sin x}(\ln 2 + \tan^2 x)$

$$\frac{(\cos x)\, 2^{\sin x} \ln 2 \cos x - (-\sin x)\, 2^{\sin x}}{(\cos x)^2}$$

$$\frac{2^{\sin x}\left((\cos x)^2 \ln 2 + \sin x\right)}{(\cos x)^2}$$

4. The graph shown below represents the velocity fucntion for a particle. At what approximate times is the particle speeding up? Use interval notation



Speeding up

$(0,2)\ (3,5)\ (6.5,8)\ (9.5,\infty)$

5. use calculator

Two particles move along the x-axis, and their positions for $0 \leq t \leq 2\pi$ are given by

$x_1 = \cos(2t)$ *and* $x_2(t) = e^{\frac{t-3}{2}} - .75$ for what values of t in that interval do the particles have the same velocity?

$v_1(t) = -2\sin(2t) = v_2(t) = e^{u}$

$\frac{1}{2}e^{\frac{t-3}{2}}$

$u = \frac{1}{2}t - \frac{3}{2}$

$du = \frac{1}{2}$

$\boxed{(1.634, -.252)\ (5.113, 1.438)\ (3.014, .503)\ (5.662, 1.892)}$

6. for the curve $x^2 + y^4 = 10$

a. Find the points at which the curve has a horizontal tangent(s)

b. find the equation of the tangent line at the point where y=1

c. find $\frac{d^2y}{dx^2}$, be sure there are no $\frac{dy}{dx}$'s in your answer, and simplify completely.

$2x + 4y^3y' = 0$

$\frac{4y^3y'}{4y^3} = \frac{-2x}{4y^3}$

$y' = \frac{-x}{2y^3}$

(A) $x = 0$

$y = \sqrt[4]{10}$

(b) $x^2 + y^4 = 10$

$x^2 + 1 = 10$

$x^2 = 9$

$x = \pm 3$

$y' = \frac{-3}{2(1)} = -3/2$

$y' = \frac{+3}{2} = +3/2$

at $(3,1)$ $y - 1 = -3/2(x-3)$ at $(-3,1)$ $y - 1 = \frac{+3}{2}(x+3)$

(c) $\frac{(2y^3)(-1) - 6y^2y'(-x)}{(2y^3)^2}$ sub in

$\frac{-2y^3 + 6xy^2\left(\frac{-x}{2y^3}\right)}{(2y^3)^2}$

then simplify

$\boxed{y'' = \frac{-1}{2y^3} - \frac{3x^2}{4y^7}}$