STATION ONE: IMPLICIT DIFFERENTIATION

1. Find the slope of the tangent line to the graph $y^3x + y^2x^2 = 6$ at the point (2,1).

2. Consider the curve given by $x^2 + 4y^2 = 7 + 3xy$

(a) Find $\frac{dy}{dx}$

(b) Show that there is a point P with a x-coordinate at 3 which the line tangent to the curve at P is horizontal. Find the y-coordinate of P.

3. Given the curve $x = x^2 - \ln(x + y) + \ln 2$, find $\frac{dy}{dx}$.

STATION TWO: EXPONENTIAL DERIVATIVES

1. Given $f(x) = x^2 e^{-4 \ln x}$, find $f'(x)$.

2. If $R(x) = \frac{2^x - 1}{5^x}$ find $R'(x)$.

3. Find an equation for a line that is normal to the graph $y = xe^x$ and goes through the origin.

4. Find the equation of the tangent line to the curve $y = xe^x - e^x$ at x = 1.

STATION THREE: LOGARITHMIC DERIVATIVES

1. If $f(x) = \log_2(3x^2 - 4)$ find $f'(x)$.

2. Find $\frac{d}{dx}[(3x)^{2\sin x}]$

3. Find the slope of the line tangent to the graph of $y = \ln x^2$ at $x = e^2$.

4. If $y = \ln\left(x\sqrt{x^2+1}\right)$, find $\frac{dy}{dx}$.

STATION FOUR: INVERSE DERIVATIVES

1. Find $\frac{d}{dx}[\sin(\cos^{-1}(3x)]$

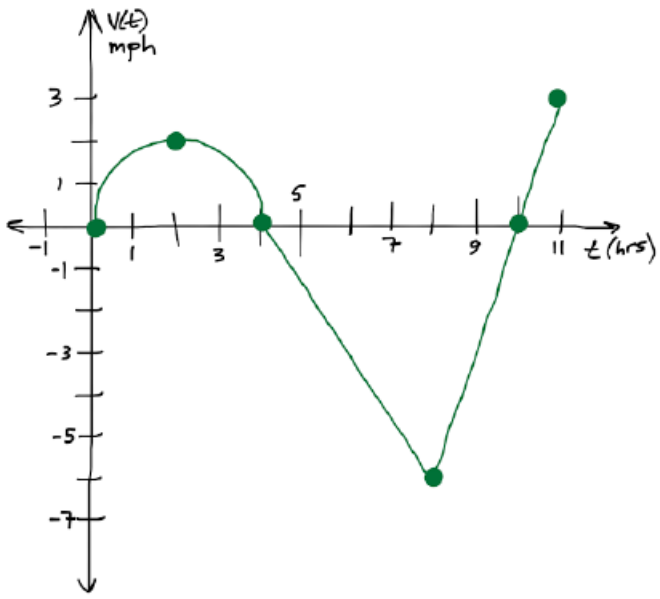
2. Find $\frac{d}{dx}[\, x\tan^{-1}(4-x^2)]$

3. A function f and its derivatives take on the values shown in the table below. If f^{-1} is the inverse of f. Find the value $(f^{-1})'(6)$.

x	*f(x)*	*f'(x)*
2	6	$\frac{1}{3}$
4	0	$\frac{3}{5}$
6	8	$\frac{3}{2}$
8	4	$\frac{2}{3}$

4. Find $\lim_{x\to 0}\frac{\sqrt{1+x}-1-\frac{x}{2}}{x^2}$

STATION FIVE: VELOCITY AND ACCELERATION



The graph above shows the velocity, *v(t)*, in miles per hour of a particle moving along the x-axis for $0 \leq t \leq 11$ hours. It consists of a semi-circle and two line segments.

1. At what time, $0 \leq t \leq 11$, is the speed of the particle the greatest?

2. At which of the times, $t = 2$, $t = 6$, or $t = 9$ hours, is the acceleration of the particle greatest? Justify.

3. Over what open time interval(s) is the particle moving to the left? Justify.

4. Over what open time interval(s) hours is the velocity of the particle increasing? Justify.

5. Over what open time interval(s) is the speed of the particle increasing? Justify.

6. At what time on the interval is the acceleration of the particle undefined?