KEY

1. Refer to the graph below of the position function s(t) of some object (e.g. a car) over the interval [0,6]. s is measured in feet, t in seconds

a) At what time does the object appear to be at rest? $t=5$

b) Find the speed, velocity and acceleration at t=3 seconds. $v(3)=50ft/s$; $a(3)=0ft/s^2$ $s(3)=|v(3)|=50ft/s$

c) State the interval where the velocity is constant. $(0,4)$

d) State the interval where velocity is increasing. $(5,6)$

2. Differentiate the following:

a) $f(x)=(2x-1)^2$ $f'(x)=2(2x-1)(2)=8x-4$

b) $y=\sin(2x^2+1)$ $f'(x)=\cos(2x^2+1)(4x)$

c) $y=\dfrac{5x^3-6x+8}{2x^2}$ $=\frac{5}{2}x-\frac{6}{2x}+\frac{4}{x^2}$ $\rightarrow \frac{dy}{dx}=\frac{5}{2}+\frac{3}{x^2}-\frac{8}{x^3}$

3. A particle moving on a line is at position $s=-2t^3+6t^2-4$ at time t.
s is measured in feet, t in seconds.

a) Write a function that describes the particle's velocity at time t. $v(t)=-6t^2+12t$

b) Write a function that describes the particle's acceleration at time t. $a(t)=-12t+12$

At 3 seconds, what is the particle's c) position, d) velocity, e) speed, f) acceleration? c) $s(3)=-4ft$ d) $v(3)=-18ft/s$ e) speed $=18ft/s$ f) $a(3)=-24ft/s^2$

g) Is the particle speeding up or slowing down at t = 3 seconds? Explain. speeding up. $v(3)$ and $a(3)$ are both $\ominus$.

h) In which direction is the particle moving at t = 3 seconds? Explain. to the left as $s(3)$ is $\ominus$

4. If $f'(x)=20x^{-3}$, a) what would the monomial function $f(x)$ equal?

b) Find the general equation: $f(x)=\frac{-10}{x^2}+C$

c) Find the specific/particular equation given (1,1) on $f(x)$. $f(x)=\frac{-10}{x^2}+11$

$1=-10+C \rightarrow C=11$

5. Find the equation of the *normal line* to $y=3x^4-2x^3+3x^2+1$ at the point where x = 1.
(The normal line is perpendicular to the tangent line)

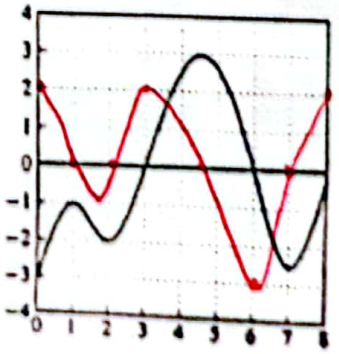
$y(1)=5$

$y'=12x^3-6x^2+6x$

$y'(1)=12 \rightarrow m_{\perp}=-\frac{1}{12}$

$(y-5)=-\frac{1}{12}(x-1)$

6. Given the following function, sketch a graph of the derivative on the same set of axes. (careful! get some good slope approximations!)



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