Pre Calc BC **Calculus Review-1** **Name_____**

1. Find the derivatives of the following functions.

a) $f(x)=\dfrac{x^3+x+\sqrt{x}}{x^2}$ b) $g(x)=e^x+\ln\left(x^3\right)$ c) $h(x)=\left(3x-1\right)^2$

d) $m(x)=x^3-3\sin x$ e) $q(x)=\log_3\left(\sqrt{x}\right)$ f) $s(x)=e^{x-1}$

2. If $f(x)=\begin{cases}x^2,\ x<2\\ ax+b,\ x\geq 2\end{cases}$ find *a* and *b* such that *f(x)* is differentiable.

3. (**calculator**) The DERIVATIVE of *f(x)* is given by $f'(x)=x^4-8x^3+15x^2+4x-20$

a) find and classify all extrema of *f(x)*

b) Find all inflection points (nearest 0.01)

4. The number of people remaining in a movie theatre *t* minutes after the film ends is given by $p(t)=10\left(7-t\right)^2$, for 0 ≤ t ≤ 7.

a) find the average rate of departure during the first 5 minutes

b) is there a time when the instantaneous rate of departure is equal to your answer from part *a*?

5. For all x near a, estimates of f(x) based on the linearization are too small. Then...

(a) f '(a) < 0 (b) f '(a) = 0 (c) f '(a) > 0 (d) f "(a) < 0 (e) f "(a) > 0

6. Find the equation of the tangent to $f(x)=e^x$ that is parallel to y = 3x

7. A particle moves along the *x*-axis with its position given by $s(t) = t^3 - 9t^2 + 24t$

a) Write an equation for the velocity

b) Determine the intervals during which the particle's velocity is positive. When is the particle at rest? How many times does the particle change direction?

c) Write an equation for the particle's acceleration.

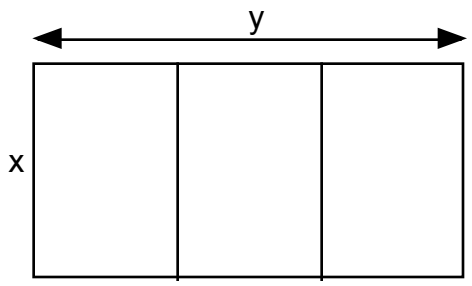
d) When is the particle speeding up (ie. when do velocity and acceleration have the same sign?)

e) What is the total *distance* travelled by the particle during the interval [0, 5] (<u>not</u> the net displacement).

f) What is the greatest negative velocity attained by the particle?

g) A photon, whose position is given by $p(t) = 4t$ is fired at $t = 0$. Do the photon and particle collide, and if so when?

8. Cowgirl Jane needs to fence some horse pasture. She wants three adjacent, congruent pastures with an area of 1 acre <u>each</u> (1 acre = 43,560 sqr ft). What is the least amount of fencing required? Show full analysis.



9. Do a complete analysis of the following with extrema and inflection points clearly classified. a) $f(x) = x^4 - 4x^3$ b) $f(x) = x + \frac{4}{\sqrt{x}}$ c) $f(x) = 3x - x^3$