1. The function f is both continuous and differentiable throughout its domain.

$$f(x)=\begin{cases} 1+3bx+2x^2, & x\le 1 \\ mx+b, & x>1 \end{cases}$$ Find m + b.

2. Let A be the number of relative minima of f if $f'(x)=\sin(e^x)$ over (0, 3.3).
Let B be the number of relative maxima of f if $f'(x)=\sqrt{\cos(x)}-0.5$ over (0,15).
Let C be the number of points of inflection of f if $f'(x)=\sin(x^2)$ over (-2.5, 2.5).
Find A + B + C.

3. If a statement is true its value is in parentheses. If a statement is false its value is 0. Find the sum of the values of the following statements.
(3) The sum of two even functions with the same domain is even.
(12) If $\lim_{x\to c} = L$, then f(c) = L.
(-1) If $y=\pi^5$, then $D_x y = 5\pi^4$.
(5) If f '(c) exists, then f is continuous at c.
(20) If h(x) = f(g(x)), where f and g are everywhere differentiable, then g '(c) = 0 implies h '(c) = 0.
(-9) The sum of two increasing functions is always an increasing function.
(13) The function $f(x)=\sqrt{x}$ satisfies the hypotheses of the Mean Value Theorem.

4. Assume that x and y are functions of t. If $-x^2y^2-4y=-44$ and $\frac{dx}{dt}=5$ when x = -3 and y = 2, find $\frac{dy}{dt}$.

5. Put the following functions in order by their rate of growth from slowest to fastest. Use the letter next to the function to order them.
A) x^{1000} B) $e^{\ln(x)}$ C) $x\ln(x)$ D) 2^x E) $(\ln 2)^x$ F) $1000x^{50}$ G) log(x) H) e^x

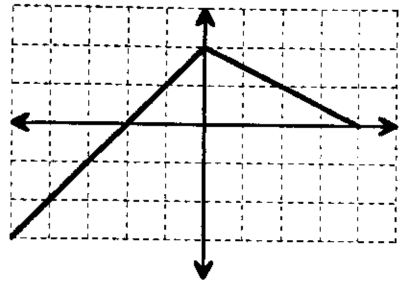
6. The area of an equilateral triangle is decreasing at a rate of 4 cm^3/min. To the nearest thousandth find the rate at which the perimeter is decreasing in cm/min when the area of the triangle is 200cm^2.

7. The number of students infected by flu in a certain school is given by the formula $P(t)=\frac{300}{1+e^{4.7-t}}$, where t is the number of days after students are first exposed to the bug, t = 0.
To the nearest day let A be the day when 70% of the maximum number of students will be infected.
Let B be the day(to the nearest day) when the flu is spreading the fastest.
Let C be the day(to the nearest day) when 172 students are infected.
Find A + B+ C.

8. If the line 3x - y + 2 = 0 is tangent in the first quadrant to the curve $y=x^3+k$, then k = ?

9. Let $f(x)=x^3-2x^2+\sin(x)$
Let A be the average rate of change of f over [0,2] to the nearest thousandth.
Let B be the x coordinate to the nearest thousandth of the point where there is the least rate of change.
Let C be the value to the nearest thousandth guaranteed by the Mean Value Theorem over [0,1].
Let D be the value of the approximate change in f(x) found by using differentials if x changes from 1 to 1.04. Find A + B + C + D.

10. The graph of g is given below. Find $\frac{dF}{dx}$ at x = 2, if $F(x) = g(x^2 - g(x) - 5)$. Each tick mark represents a unit of 1.



11. To the nearest whole number what is the largest possible area in square inches for a right triangle whose hypotenuse is 10 inches long?

12. Given $f(x) = 1 + 3e^x - 5x$. Give all answers to the nearest thousandth.
Let A be the x coordinate of the point where the tangent line to f is horizontal.
Let B be the x coordinate of the point where the tangent line is parallel to $3x - y = 7$.
Let C be the absolute minimum value of f over [-1, 1].
Let $D = \lim_{x \to -\infty} f'(x)$.
Find A+ B+ C+D.

13. The Mostel Company has a manufacturing process that produces a radioactive waste by product with a half life of twenty years. To the nearest thousandth in how many years will 99% of the original mass decay?

14. A right triangle of hypotenuse 10 units is rotated about one of its legs to generate a circular cone. To the nearest thousandth what is the greatest possible volume of this cone?

15. Pat walks at the rate of 5 ft/s toward a street light whose lamp is 20 ft above the base of the light. If Pat is 6 ft tall, determine the rate at which Pat's shadow is decreasing at the moment when Pat is 24 ft from the base of the lamppost.