1.(1 pt) Let $y = 4x^2$.
Find the change in y, Δy when $x = 3$ and $\Delta x = 0.1$ ______
Find the differential dy when $x = 3$ and $dx = 0.1$ ______

2.(1 pt) Let $y = 3\sqrt{x}$.
Find the change in y, Δy when $x = 1$ and $\Delta x = 0.3$ ______
Find the differential dy when $x = 1$ and $dx = 0.3$ ______

3.(1 pt) Let $y = 4x^2 + 7x + 3$.
Find the differential dy when $x = 4$ and $dx = 0.2$ ______
Find the differential dy when $x = 4$ and $dx = 0.4$ ______

4.(1 pt) Let $y = \tan(5x + 5)$.
Find the differential dy when $x = 3$ and $dx = 0.1$ ______
Find the differential dy when $x = 3$ and $dx = 0.2$ ______

5.(1 pt) The linear approximation at $x = 0$ to $\sqrt{3 + 9x}$ is $A + Bx$ where A is: ______ and where B is: ______

6.(1 pt) The linear approximation at $x = 0$ to $\sin(2x)$ is $A + Bx$ where A is: ______ and where B is: ______

7.(1 pt) The linear approximation at $x = 0$ to $\frac{1}{\sqrt{6-x}}$ is $A + Bx$ where A is: ______ and where B is: ______

8.(1 pt) Use linear approximation, i.e. the tangent line, to approximate $\sqrt{16.4}$ as follows:
Let $f(x) = \sqrt{x}$. The equation of the tangent line to $f(x)$ at $x = 16$ can be written in the form $y = mx + b$ where m is: ______
and where b is: ______
Using this, we find our approximation for $\sqrt{16.4}$ is
NOTE: For this part, give your answer to at least 9 significant figures or use fractions to give the exact answer.

______

9.(1 pt) Use linear approximation, i.e. the tangent line, to approximate $\sqrt[3]{1.2}$ as follows:
Let $f(x) = \sqrt[3]{x}$. The equation of the tangent line to $f(x)$ at $x = 1$ can be written in the form $y = mx + b$ where m is: ______ and where b is: ______
Using this, we find our approximation for $\sqrt[3]{1.2}$ is ______

10.(1 pt) Use linear approximation, i.e. the tangent line, to approximate 11.1^2 as follows:
Let $f(x) = x^2$ and find the equation of the tangent line to $f(x)$ at $x = 11$.
Using this, find your approximation for 11.1^2

______

11.(1 pt) Use linear approximation, i.e. the tangent line, to approximate 4.7^3 as follows:
Let $f(x) = x^3$. The equation of the tangent line to $f(x)$ at $x = 5$ can be written in the form $y = mx + b$ where m is: ______ and where b is: ______
Using this, we find our approximation for 4.7^3 is

______

12.(1 pt) Use linear approximation, i.e. the tangent line, to approximate 2.8^3 as follows:
Let $f(x) = x^3$. The equation of the tangent line to $f(x)$ at $x = 3$ can be written in the form $y = mx + b$ where m is: ______ and where b is: ______
Using this, we find our approximation for 2.8^3 is ______

13.(1 pt) Use linear approximation, i.e. the tangent line, to approximate $\frac{1}{1.001}$ as follows: Let $f(x) = \frac{1}{x}$ and find the equation of the tangent line to $f(x)$ at a "nice" point near 1.001. Then use this to approximate $\frac{1}{1.001}$.

______

14.(1 pt) Suppose that you can calculate the derivative of a function using the formula $f'(x) = 4f(x) + 2x$. If the output value of the function at $x = 2$ is 6 estimate the value of the function at 2.014. ______

15.(1 pt) The circumference of a sphere was measured to be 74.000 cm with a possible error of 0.50000 cm. Use linear approximation to estimate the maximum error in the calculated surface area. ______
Estimate the relative error in the calculated surface area. ______

16.(1 pt) Use linear approximation to estimate the amount of paint in cubic centimeters needed to apply a coat of paint 0.090000 cm thick to a hemispherical dome with a diameter of 35.000 meters.

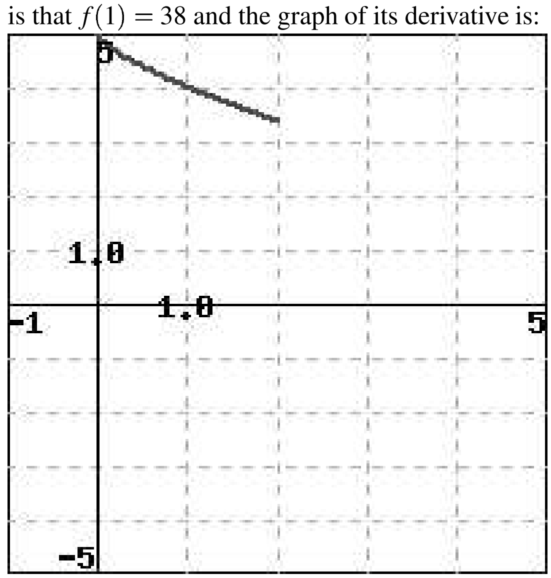
______

17.(1 pt) Let $f(t)$ be the weight (in grams) of a solid sitting in a beaker of water. Suppose that the solid dissolves in such a way that the rate of change (in grams/minute) of the weight of the solid at any time t can be determined from the weight using the forumula:

$$f'(t) = -3f(t)(6 + f(t))$$

If there is 2 grams of solid at time $t = 2$ estimate the amount of solid 1 second later. ______

18.(1 pt) Suppose you have a function $f(x)$ and all you know is that $f(1) = 38$ and the graph of its derivative is:



Use linear approximation to estimate $f(1.2)$: ______
Is your answer a little to big or a little too small?(Enter TB or TS): ______