Student: Cole Lamers **Date:** 09/14/19	**Instructor:** Viktoriya Shcherban **Course:** Calc 1 11:30 AM / Internet (81749&81750) Shcherban	**Assignment:** 3.9 Linearization and Differentials

1. Find the linearization L(x) at x = a.

   $f(x) = -4x^3 + 3x + 1 \qquad a = -2$

   $L(x) = -45x - 63$

2. Find the linearization L(x) at x = a.

   $f(x) = x + \frac{1}{x}, \quad a = -1$

   $L(x) = -2$

   (Simplify your answer.)

3. Find the linearization L(x) of f(x) = **tan** x at x = 0.

   The linearization is given by $L(x) = x$.

   (Type an exact answer, using π as needed.)

4. Find a linearization that will replace the function over an interval that includes the given point x_0. Center each linearization not at x_0 but at a nearby integer, x = a, at which the given function and its derivative are easy to evaluate.

   $f(x) = x^2 + 6x, \; x_0 = .01$

   Set the center of the linearization as x = 0.

   $L(x) = 6x$

5. Find a linearization at a suitably chosen integer near a at which the given function and its derivative are easy to evaluate.

   $f(x) = 2x^2 + 6x - 3, \; a = -0.9$

   Set the center of the linearization as x = −1.

   $L(x) = 2x - 5$

6. Find a linearization that will replace the function over an interval that includes the given point x_0. Center each linearization not at x_0 but at a nearby integer, x = a, at which the given function and its derivative are easy to evaluate.

   $f(x) = \sqrt[3]{x}, \; x_0 = 216.4$

   Set the center of the linearization as x = 216.

   $L(x) = \frac{1}{108}x + 4$

7. Find dy for $y = 2x^6 - 3\sqrt{5x}$.

$$dy = \left(12x^5 - \frac{15}{2\sqrt{5x}}\right) dx$$

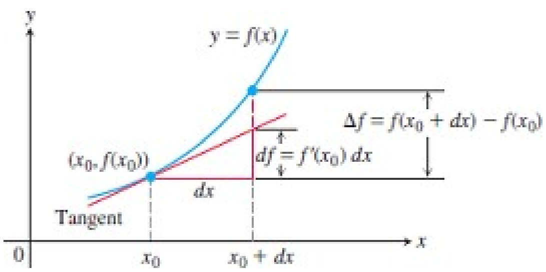
8. Find dy.

$$y = \sin\left(15\sqrt{x}\right)$$

$$dy = \frac{15\cos 15\sqrt{x}}{2\sqrt{x}}\, dx$$

9. Each function f(x) changes value when x changes from x_0 to $x_0 + dx$. Find the change $\Delta f = f(x_0 + dx) - f(x_0)$, the value of the estimate $df = f'(x_0)\,dx$, and the approximate error $|\Delta f - df|$.

$f(x) = 6x^2 - 5x$, $x_0 = -1$, $dx = 0.1$



The change $\Delta f =$ -1.64.
(Simplify your answer. Type an integer or a decimal.)

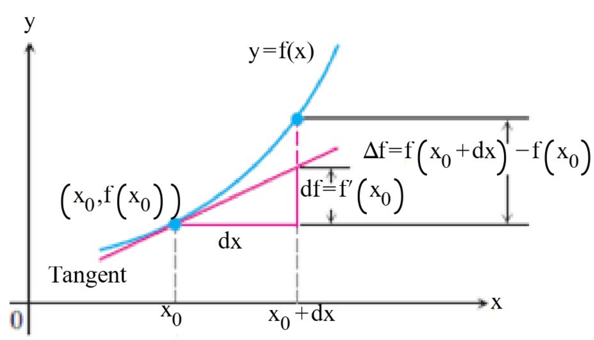
The value of the estimate $df =$ -1.7.
(Simplify your answer. Type an integer or a decimal.)

The approximate error is .06.
(Simplify your answer. Type an integer or a decimal.)

10. The function f(x) changes value when x changes from x_0 to $x_0 + dx$.

$f(x) = 4x^2 - 9x - 3$, $x_0 = 1$, $dx = 0.1$

a. Find the change $\Delta f = f\left(x_0 + dx\right) - f\left(x_0\right)$.
b. Find the value of the estimate $df = f'\left(x_0\right)\,dx$.
c. Find the approximate error $|\Delta f - df|$.



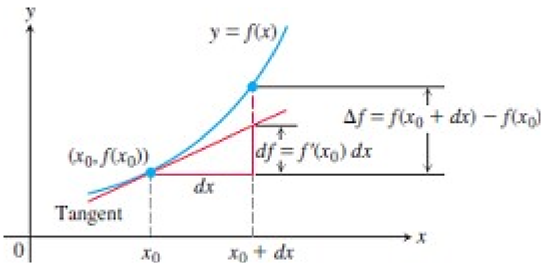
a. The change Δf is $-.06$.
(Simplify your answer. Type an integer or a decimal.)

b. The value of the estimate df is $-.1$.
(Simplify your answer. Type an integer or a decimal.)

c. The approximate error is .04.
(Simplify your answer. Type an integer or a decimal.)

11. Each function f(x) changes value when x changes from x_0 to $x_0 + dx$. Find the change $\Delta f = f(x_0 + dx) - f(x_0)$, the value of the estimate $df = f'(x_0)\, dx$, and the approximate error $|\Delta f - df|$.

$f(x) = 5x^{-4}$, $x_0 = -1.5$, $dx = 0.1$



The change $\Delta f =$ .314 .
(Round to the nearest thousandth.)

The value of the estimate $df =$ .263 .
(Round to the nearest thousandth.)

The approximate error is .051 .
(Round to the nearest thousandth.)

12. Write a differential formula that estimates the change in the volume $V = \frac{4}{3}\pi r^3$ of a sphere when the radius changes from r_0 to $r_0 + dr$.

Choose the correct answer below.

- **A.** $dV = \frac{4}{3}\pi r_0^2\, dr$
- **B.** $dV = 4\pi r_0^2\, dr$
- **C.** $dV = 4\pi r_0^3\, dr$
- **D.** $dV = 4\pi r^2\, dr$

13. Estimate the volume of material in a cylindrical shell with height 43 in., radius 9 in., and shell thickness 0.3 in. Assume the height is fixed.

The estimated volume of material is 729.5 in.^3.
(Round to the nearest tenth.)

14. The volume of a solid can be expressed as $V = 7x^3$. The volume is to be calculated with an error of no more than 2% of the true value. Find approximately the greatest error that can be tolerated in the measurement of x, expressed as a percentage of x.

The greatest tolerated error in the measurement of x is $\frac{2}{3}$ %.

(Simplify your answer.)