 Name_____

Differentials

Date_____ Period____

For each problem, find the differential *dy*.

1) $y = -x^3 - 2$

2) $y = -\frac{3}{x}$

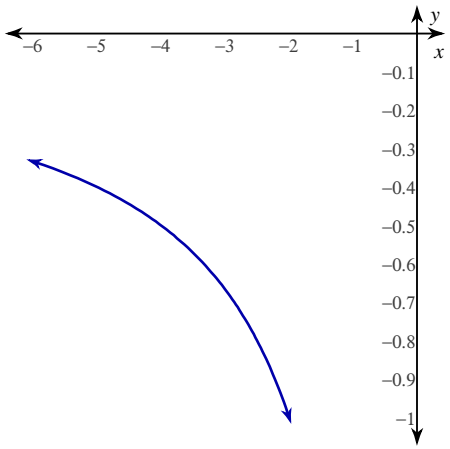
For each problem, find the general formulas for *dy* and Δ*y*.

3) $y = -x^3 - 2$

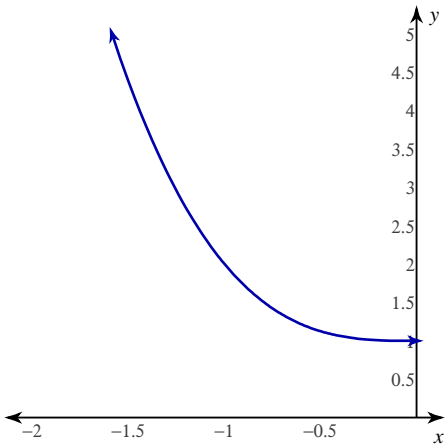
4) $y = \frac{2}{x}$

For each problem, find *dy* and Δ*y*, given x_0 and *dx* = Δ*x*. You may use the provided graph of the function to sketch *dx*, Δ*x*, *dy*, and Δ*y*.

5) $y = \frac{2}{x}$; $x_0 = -5$, $dx = \Delta x = \frac{5}{2}$



6) $y = -x^3 + 1$; $x_0 = -1$, $dx = \Delta x = -\frac{1}{2}$



For each problem, find a linear approximation of the given quantity.

7) $\sin 122°$

8) 6.99^4

Use differentials to solve each problem.

9) The radius of a sphere is measured to be 7 cm, with a possible error of $\pm\frac{1}{10}$ cm. Estimate the possible propagated error in the calculated volume.

10) The sides of a square are measured to be 4 in, with a possible error of $\pm\frac{1}{5}$ in. Estimate the possible propagated error in the calculated area.

 Name_____

Differentials

Date_____ Period____

For each problem, find the differential *dy*.

1) $y = -x^3 - 2$

$dy = -3x^2 dx$

2) $y = -\frac{3}{x}$

$dy = \frac{3}{x^2} dx$

For each problem, find the general formulas for *dy* and Δ*y*.

3) $y = -x^3 - 2$

$dy = -3x^2 dx$

$\Delta y = -3x^2 \Delta x - 3x(\Delta x)^2 - (\Delta x)^3$

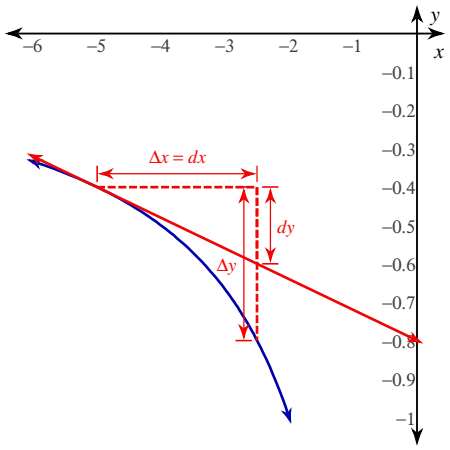
4) $y = \frac{2}{x}$

$dy = -\frac{2}{x^2} dx$

$\Delta y = -\frac{2\Delta x}{x^2 + x\Delta x}$

For each problem, find *dy* and Δ*y*, given x_0 and *dx* = Δ*x*. You may use the provided graph of the function to sketch *dx*, Δ*x*, *dy*, and Δ*y*.

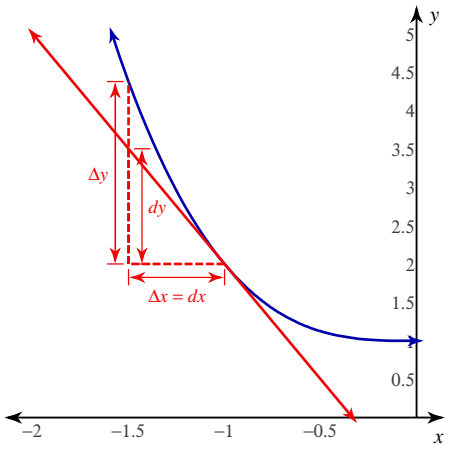
5) $y = \frac{2}{x}$; $x_0 = -5$, $dx = \Delta x = \frac{5}{2}$



$dy = -\frac{1}{5} = -0.2$

$\Delta y = -\frac{2}{5} = -0.4$

6) $y = -x^3 + 1$; $x_0 = -1$, $dx = \Delta x = -\frac{1}{2}$



$dy = \frac{3}{2} = 1.5$

$\Delta y = \frac{19}{8} = 2.375$

For each problem, find a linear approximation of the given quantity.

7) $\sin 122°$

$f(x) = \sin x,\ f'(x) = \cos x$

$x_0 = \frac{2\pi}{3}$ radians, $\Delta x = \frac{\pi}{90}$ radians

$f(x_0 + \Delta x) \approx f(x_0) + f'(x_0)\Delta x = \frac{90\sqrt{3} - \pi}{180} \approx 0.8486$

8) 6.99^4

$f(x) = x^4,\ f'(x) = 4x^3$

$x_0 = 7,\ \Delta x = -0.01$

$f(x_0 + \Delta x) \approx f(x_0) + f'(x_0)\Delta x = \frac{59682}{25} = 2387.28$

Use differentials to solve each problem.

9) The radius of a sphere is measured to be 7 cm, with a possible error of $\pm\frac{1}{10}$ cm. Estimate the possible propagated error in the calculated volume.

$V = \frac{4}{3}\pi r^3,\ dV = 4\pi r^2\ dr$

$r = 7,\ dr = \pm 0.1$

$\Delta V \approx dV = \pm\frac{98\pi}{5} \approx \pm 61.5752$ cm³

10) The sides of a square are measured to be 4 in, with a possible error of $\pm\frac{1}{5}$ in. Estimate the possible propagated error in the calculated area.

$A = s^2,\ dA = 2s\ ds$

$s = 4,\ ds = \pm 0.2$

$\Delta A \approx dA = \pm\frac{8}{5} = \pm 1.6$ in²