Homework #10

Will Arbito
Ryan Zhao

#2

B.A is B.S

$L(x)$ at a

$f(x) = \ln(x)$ $a = 1$

$1/x = 1$

$\ln(1)$

$(y - y_0) = 1(x - x_0)$

$y - 0 = 1(x - 1)$

$y = x - 1$

$m = 1$

$y = \ln(x)$

$\ln(1)$

$y = 0$

New Group

point $(1,0)$

#6 $g(x) = \sqrt{1+x}$

$g(x)' = 1/3\,(1-x)^{-4/3}$

$y-1 = 1/3\,(x-0)$

$y = 1 + 1/3\,(x-0)$

at $x = -.05$

$y \approx 1 + 1/3\,(0.05-0) \approx .098$

at $x = 0.1$

$y \approx 1.03$

3.10

TEAM : C.A.M.

16

$$y = 1/(x+1) \quad , x=1 \quad , dx = {}^{-}0.01$$

$$\frac{dy}{dx} = \frac{1}{x} \cdot \frac{dx}{dt}$$

$$\frac{dy}{d\varepsilon} = \frac{1}{x} \cdot \frac{dx}{d\varepsilon}$$

DIFFERENTIAL dy

$$dy = \frac{1}{x} \cdot dx$$

$$\Delta y \approx dy = \frac{1}{x} \cdot dx$$

$$dx = \Delta x$$

$$dy = \frac{1}{(1)} \cdot (-0.01)$$

$$dy = {}^{-}0.01$$

CASANDRA LUCERO
Augustin Ciocotisan
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FR3CH

3.10 # 18 | 252 : $y = \cos x$

a| Find the differential dy :

We have $dy = f'(x)\,dx$

Thus $dy = (\cos x)'\,dx$

$= -\sin x\,dx$

b| $x = \pi/3$; $dx = 0.05$: $dy = ?$

$dy = -\sin x\,dx$

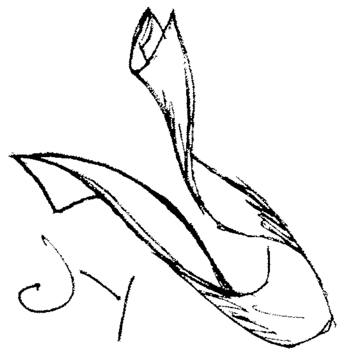
With $x = \pi/3$, $dx = 0.05$ we have

$dy = (-\sin \frac{\pi}{3})(0.05)$

$= \left(-\frac{\sqrt{3}}{2}\right)(0.05) = \left(-\frac{\sqrt{3}}{2}\right)\left(\frac{1}{20}\right)$

$= -\frac{\sqrt{3}}{20}$

#20



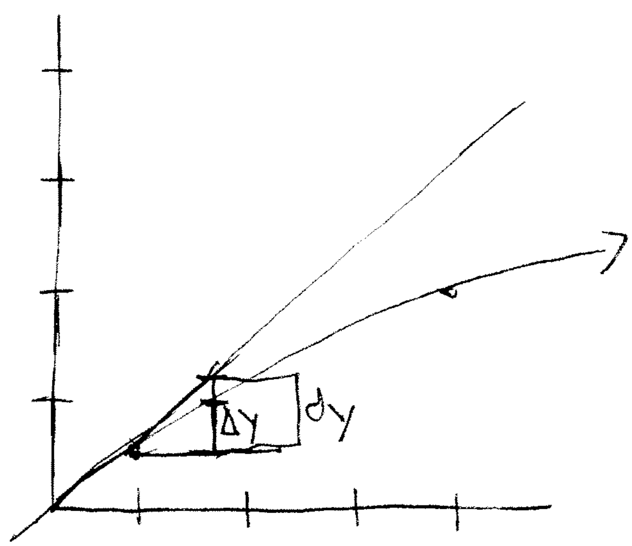
Sam Tobia
Pablo Espichan
TIEJUN WEN

Compute Δy, dy

$y=\sqrt{x}$ $x=1$ $\Delta x=1$

$\Delta y = f(x+\Delta x)-f(x)$
$= f(1+1)-f(1)$
$= \sqrt{2}-1 = .41421\ldots$

$dy = \frac{1}{2}x^{-\frac{1}{2}} \cdot dx$
$= \frac{1}{2}(1)^{-\frac{1}{2}} \cdot 1$
$= \frac{1}{2}$ $.5$



GRUNDLE PUMPKINS

Kristian Feher, Melva Avila, Jalisha Crews   Save the Polar Bears
3.10 #22
Mat: 151

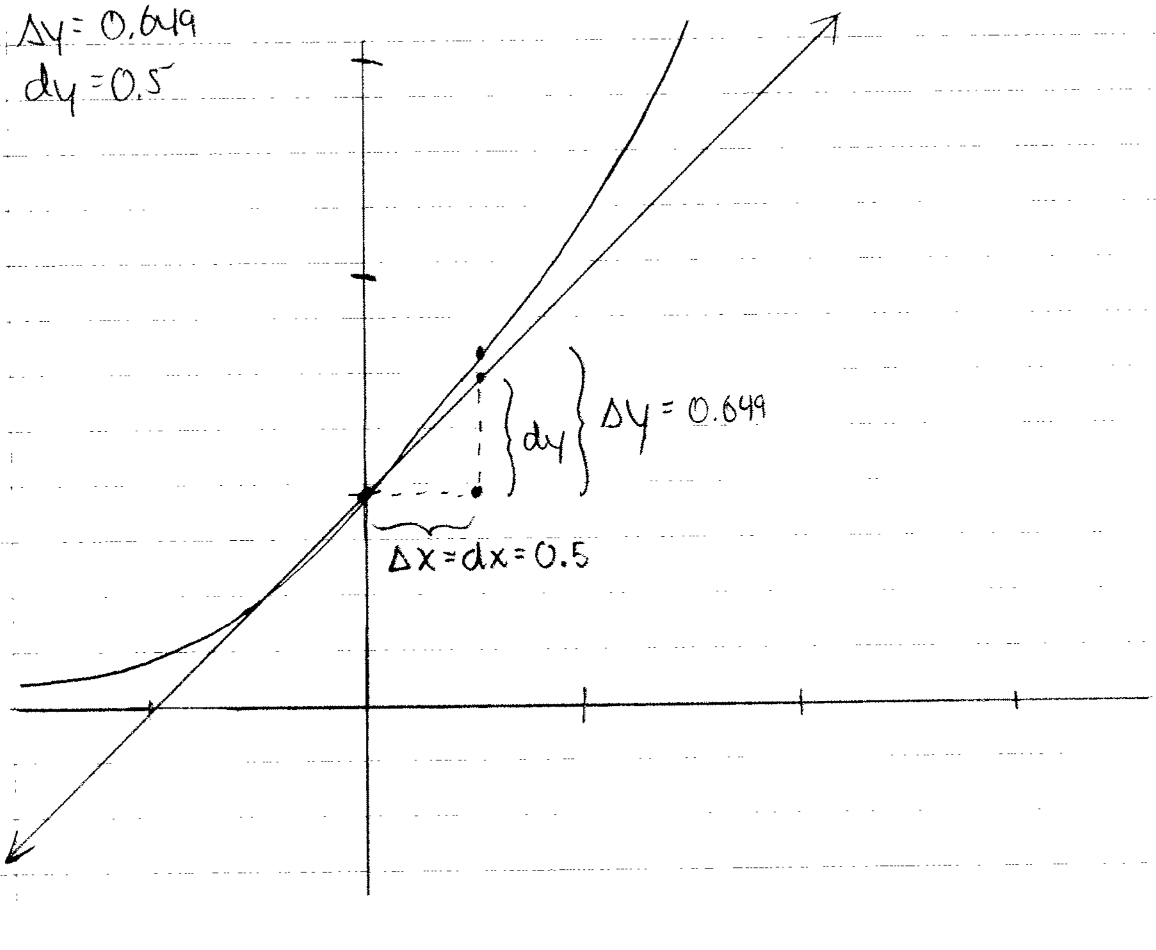
$y = e^x$, $x = 0$, $\Delta x = 0.5$

$f(x) = e^x$ $f(x) = e^x$
$f(0) = e^{(0)} = 1$ $f(0.5) = 1.649$

$\Delta y = f(\Delta x) - f(x) = f(0.5) - f(0) = 0.649$

$dy = f'(x)dx = e^x(dx)$
$dy = e^{(0)}(0.5)$
$dy = 0.5$

$\Delta x = 0.5$
$\Delta y = 0.649$
$dy = 0.5$



Science Buddies

#23 $(2.001)^5$

To estimate $(2.001)^5$, we'll find the linearization of $f(x) = x^5$ at $a = 2$

Since $f'(x) = 5x^4$

$f(2) = 32$, and $f'(2) = 80$

We have $L(x) = 32 + 80(x-2) = 80x - 128$

Thus, $x^5 \approx 80x - 128$ when x is near 2,

So $(2.00)^5 \approx 80(2.001) - 128$

$= 16.08 - 128 = \boxed{32.08} =$ Ans

3.10 #24 Yves Mosoula

(24) $e^{-0.015}$

$f(x) = e^x$

$f(x) = f(a) + f'(a)(x-a)$

$a = 0$

$f(x) = f(0) + f'(0)(x-0)$

$f(x) = 1 + x$

$e^{-0.015} = f(-0.015) = 1 - 0.015 = 0.985$

L. W. V
Letrice
Wilgens
Viviene

3/10/10

3.10
#25

Use linear approximation to estimate the given number.

$(8.06)^{2/3}$

$x^{2/3}$ $a = 8.$ (approximation)

$f(x) \approx f(a) + f'(a)(x-a).$

$f(x) = f(x) + f'(x)(x-a)$

$f(x) = x^{2/3}.$

$f'(x) = 2/3\, x^{-1/3}$

$= \dfrac{2}{3\sqrt[3]{x}}$

$f(x) = x^{2/3}$

$f(8) = 8^{2/3}$

$f(8) = 4.$

$f'(x) = 2/3\, x^{-1/3}$

$f'(8) = 2/3\; 8^{-1/3}$

$= 2/3 \left(\dfrac{1}{\sqrt[3]{8}}\right)$

$= 2/3\,(2)$

$f'(8) = 1/3$

$L(x) = f(a) + f'(a)(x-a).$

$L(x) = f(8) + f'(8)(x-8) = 4 + 1/3(x-8)$

$= 4 + 1/3\,x - \dfrac{8}{3}$

$= 4 + 1/3\,x - 8/3$

$= 4 - \dfrac{8}{3} + \dfrac{1}{3}x$

$= \dfrac{12-8}{3} + \dfrac{1}{3}x$

$= \dfrac{4}{3} + \dfrac{1}{3}x \;;\; \dfrac{1}{3}x + \dfrac{4}{3}$

$\therefore (8.06)^{2/3}$

$= \dfrac{1}{3}(8.06) + \dfrac{4}{3}$

$= \dfrac{8.06}{3} + \dfrac{4}{3}$

$= \dfrac{12.06}{3}$

$= \underline{\underline{4.02}}$

#26

Empire: Laquan, Fabian, Sal

$1/1002$

$f(x) = 1/x$ $\qquad$ $f'(a) = -\frac{1}{10^6}$

$a = 1000$

$\Delta x = 2$

$f(a) = .001$

$f(a) + f'(a)(x-a)$

$.001 + \left(-\frac{1}{10^6}\right)(1002 - 1000)$

$.001 + \left(-\frac{2}{10^6}\right)$

$.001 - .000002$

$= -.000998$

Team Kickass

3.10 #27

Use a linear approximation (or differentials) to estimate the given number.

$\tan 44^\circ$

$f(x) = \tan\left(\frac{\pi}{180}x\right)$

$x_0 = 45^\circ$

$\Delta x = 44^\circ - 45^\circ = -1^\circ$

$f'(x_0) = \sec^2 x \frac{\pi}{180} = \frac{1}{\cos^2 x} = \frac{1}{\left(\frac{\sqrt{2}}{2}\right)^2} = \frac{4}{2} = 2\frac{\pi}{180}$

$f(x) \approx \tan 45^\circ - \frac{2\pi}{180}(x-45)$

$1 - \frac{2\pi}{180}(44-45)$

$1 - \frac{2\pi}{180} = .97$

Pythagorus

28 $\sqrt{99.8}$

$y = f(x) = \sqrt{x}$
$= x^{\frac{1}{2}}$

$\frac{dy}{dx} = \frac{1}{2} x^{-\frac{1}{2}}$

$\frac{dy}{dx} = \frac{1}{2\sqrt{x}}$

$dy = \frac{dx}{2\sqrt{x}}$

when $x = 100$, $dx = -0.2$

$dy = \frac{1}{2\sqrt{100}} (-0.2)$

$= \frac{1}{20}(-0.2) = \frac{1}{\cancel{20}_{10}}\left(\frac{-\cancel{2}}{10}\right) = \frac{-1}{100} = -.01$

$f(100) + dy = 10 - 0.01 = 9.99$

calculator answer: 9.989

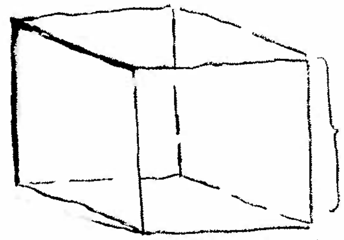
Mike Gankhuyag
Jonathan Chen

3/8/10

MAT151 ... Team α

3.10) # 33

I.) given:



30 cm

possible error = 0.1 cm

a1.) max. possible error: $[V = e^3 \Rightarrow \frac{dV}{dx} = \frac{d}{dx}(e^3) \Rightarrow dV = 3e^2 \frac{d}{dx}(e)$

error $\approx \Delta V \approx dV = 3e^2 de \Rightarrow dV = 3(30)^2(0.1) \approx 270$

ans: $\{V = 2700 \pm 270\}$ the max error in calculated (V) is about 270 cm^3

a2.) relative error:

$$\frac{\Delta V}{V} \approx \frac{dV}{V} = \frac{3e^2 de}{e^3} = 3\frac{de}{e} \Rightarrow 3\frac{(0.1)}{30} = 0.01$$

ans: percentage error: a.) in edge: 0.33% : $[\frac{0.1}{30}(100) = 0.33]$
b.) in vol: 1% : $[3(\frac{0.1}{30})(100) = 0.1]$

b1.) max. possible error: $[A = 6e^2 \Rightarrow \frac{dA}{dx} = \frac{d}{dx}(6e^2) \Rightarrow dA = 12e \frac{d}{dx}(e)]$

error $\approx \Delta A \approx dA = 12e\,de \Rightarrow dA = 12(30)(0.1) \approx 36$

ans: $\{A = 5400 \pm 36\}$ the max error in calculated (A) is about 36 cm^2

b2.) relative error: $\frac{\Delta A}{A} \approx \frac{dA}{A} = \frac{12e\,de}{6e^2} = 2\frac{de}{e} \Rightarrow 2\frac{(0.1)}{30} = 0.0066$

ans: percentage error: in s/a: $2(\frac{0.1}{30})(100) = 0.67\%$

$\boxed{\text{SEC 3.10 - PROB \#35}}$

$\boxed{\text{CIVARC}}$

J. KOHLHEPP
R. D'SOUZA
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C = 84cm dc ERROR = 0.50cm   d = 26.74cm r = 13.37cm

$C = 2\pi r \;,\; S = 4\pi r^2$

a.) $r = \frac{C}{2\pi} \quad S = \left(\frac{C}{2\pi}\right)^2 = \frac{C^2}{\pi}$

$ds = \frac{2}{\pi} c\,dc$

$ds = \frac{2}{\pi}(84cm)(0.50cm) = \frac{84cm}{\pi} = 26.74\,cm^2 \sim 27\,cm^2$

RELATIVE ERROR: $\frac{ds}{S} = \frac{84\pi}{84^2\pi} = \frac{263.89}{22167.07} = 0.012$

b.) $dV = 4\pi r^2 dr$

$dv = \frac{4\pi(13.37cm)^2\,0.50cm}{2\pi} = \frac{1122.59\,cm^3}{2\pi} = 179\,cm^3$

RELATIVE ERROR: APPROX 1.5 TIMES RELATIVE ERROR THE "C" = 0.012 x 1.5 = 0.18

Diesel

#36 3.10 Connor Payne, Tyler Ferst, Stanley Tucker

Use differentials to estimate the amount of paint needed to apply a coat of paint .05 cm thick to a hemispherical dome with a diameter of 50m.

$A = 4\pi r^3$

$A' = 2\pi r^2$ $V = \frac{4}{3}\pi r^3$ $50m = D$

$dA = 4\pi r\,dr$ $dV = 4\pi r^2\,dr$ $25m = r$

$.05cm = dr$

$dA = 4\pi(25^2)\,dr$

$4\pi(25m)^2 \cdot .0005m$

$4\pi(625)\ .0005\,m$

$dV = 3.926990817\,m^3$