??
f
f
$x =$
c
f
$$y = (c)(x-c)+f(c).$$

$f(x)$
x
c
$\sin 1.1$
$f(x) =$
$\sin x$
$x =$
$\pi/3 \approx$
$1.05.$
$\sin(\pi/3) =$
$\sqrt{3}/2 \approx$
0.866
$\cos(\pi/3) =$
$1/2$
$f(x) =$
$\sin x$
$x =$
$\pi/3$
$$\ell(x) = \frac{1}{2}(x-\pi/3)+0.866.$$

$f(x) =$
$\sin x$
$x =$
$\pi/3$

$\sin 1.1$

??
$f(x) =$
$\sin x$
$x =$
$\pi/3$
??
$\sin 1.1$
1.1
$\sin 1.1$
$\ell(1.1) =$
$\frac{1}{2}(1.1-$
$\pi/3)+$
0.866
$=$
$\frac{1}{2}(0.053)+$
$0.866 =$
$0.8925.$
$f(x)$
x
c
$\ell(x) =$
$(c)(x-$
$c)+$
$f(c)$
$f(c) =$
$\ell(c)$
x
$$f(c+) \approx y(c+),$$

$x =$
c
x
c
$c+$
y
f
$f(c)$
$f(c+)$
y
$$= f(c+)-f(c).$$

$f(c+)$
$\approx$
$y(c+)-$
$f(c)$
$=$
$(c)\big((c+)-$
$c\big)+$
$f(c)-$
$f(c)$
$=$
(c)
dx

$dy \approx$
$_d iffal1 Finding and using differentials Consider$
^{2}
$f(3) =$
9
$f(3.1)$
$x =$
3
$x =$
3.1
$dx =$
0.1
y
$f(3)$
$f(3.1)$
$f(3.1)$
$f(3)$
dy
$\approx$
dy
$=$
$(3)dx$
$=$
2.
3.
$0.1 =$
0.6.
y
0.6
$f(3.1) \approx$
9.6.
$f(x)$
$x =$
3
$x =$
3.1
$y =$
9.6
$3.1^2 =$
9.61.
re-ally ve-loc-ity ap-prox-i-mate
$_d iffal2 Using differentials to approximate a function value Approximate \sqrt{4.5}$
$\sqrt{4.5} \approx$
2
$f(x) =$
$\sqrt{x}$
$c =$
4
$f(4) =$
2
$(x) =$
$1/(2\sqrt{x})$
$(4) =$
1/4
$f(4.5)$
$f(4)$
$dx =$
0.5

$$f(4.5) - f(4) = \approx dy = (4) \cdot dx = 1/4 \cdot 1/2 = 1/8 = 0.125.$$

$\sqrt{4.5} \approx$
2.125.
in-te-gra-tion

$$\int f(x)dx$$

dx
in-te-grals
$_d iffal3 Finding differentials In each of the following, find the differential.$
$y =$
$\sin x$
$y =$
$e^x(x^2 +$
$2)$
$y =$
$\sqrt{x^2 + 3x - 1}$
$y =$
$\sin x$