MCV4UI
Lesson 4.3

Derivatives of $y = e^x$

Examples: $y = e^x$ & $y' = e^x$

1 a) $\frac{d}{dx}\left(e^{4x^2+3x}\right)$

$= e^{4x^2+3x}(8x+3)$

b) $\frac{d}{dx}\left(\frac{e^{2x}}{3e^{2x}-1}\right)$

$= \frac{2e^{2x}(3e^{2x}-1) - e^{2x}(6e^{2x})}{(3e^{2x}-1)^2}$

$= \frac{2e^{2x}(3e^{2x} - 1 - 3e^{2x})}{(3e^{2x}-1)^2}$

$= \frac{-2e^{2x}}{(3e^{2x}-1)^2}$

2. For $y = xe^{-x}$

a) Find all critical points.

$y' = e^{-x} + x(e^{-x})(-1)$

$0 = e^{-x} - xe^{-x}$

$0 = e^{-x}(1-x)$

$x = 1 \qquad y = \frac{1}{e} \quad (0.37)$

b) Check concavity

$y'' = -e^{-x} - (e^{-x} + x(-e^{-x}))$

$= -e^{-x} - e^{-x} + xe^{-x}$

$= e^{-x}(-2+x)$

$y''(1) < 0$ ∩

c) Find points of inflection

$e^{-x}(-2+x) = 0$

$x = 2 \qquad y = 0.27$

P.O.I.: $(2, 0.27)$

d) Find intervals of concavity

Int	y''	
$x < 2$	−	CD ∩
$x > 2$	+	CU ∪

e) Find x, y-intercepts

$y = xe^{-x}$

x-int: 0

y-int: 0

g) Find the equation of the tangent at x = -1.

$m = y'(-1) = e^{-(-1)}(1-(-1))$

$= 2e$

$y = 2e(x+1) - e$

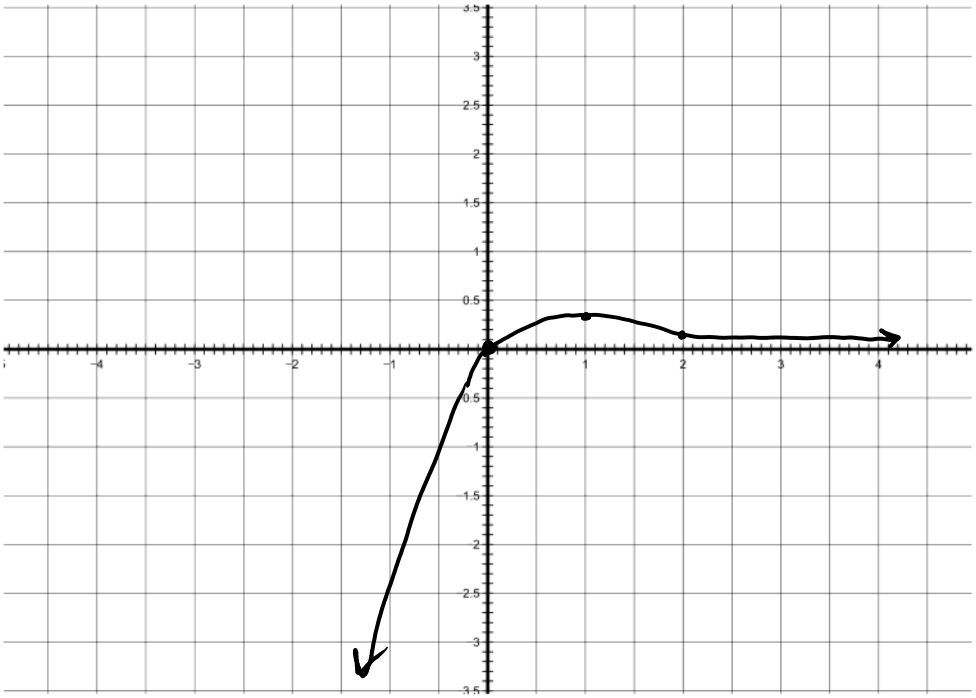
$y = 2ex + 2e - e$

$y = 2ex + e$

$y = -e$

$y = m(x-p)+q$
m → slope
(p, q) → pt

f) Graph



HW: Handout # 1-40

From <Lesson 4.3 Derivatives of e.doc>