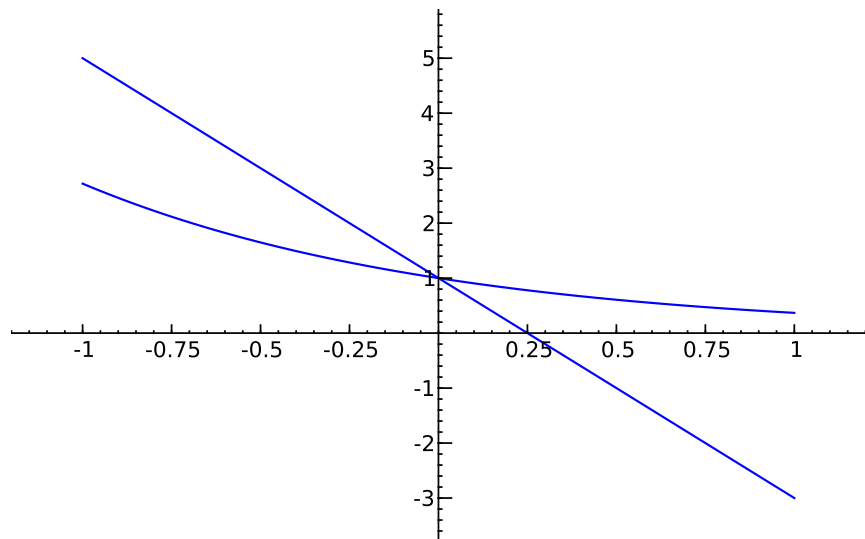


MATH 20C: FUNDAMENTALS OF CALCULUS II
QUIZ #5

Problem 1. Compute the area between $y = e^{-x}$ and $y = -4x + 1$ for x in $[0, 1]$. Include a graph.

Solution. We have the following graph:



The area is

$$\int_0^1 (e^{-x} - (-4x + 1)) dx = (-e^{-x} + 2x^2 - x) \Big|_0^1 = (-e^{-1} + 2 - 1) - (-1) = 2 - 1/e.$$

Problem 2. Use the formula

$$FV = \int_a^b R(t)e^{r(b-t)} dt$$

to find the future value of the income stream $R(t) = 200t$ for $0 \leq t \leq 10$ at 10%.

Solution. We have

$$FV = \int_0^{10} 200te^{0.1(10-t)} dt = 200 \int_0^{10} te^{1-0.1t} dt.$$

We use integration by parts:

	D		I
+	t		$e^{1-0.1t}$
-	1	$e^{1-0.1t}/(-0.1) = -10e^{1-0.1t}$	
+ \int	0		$100e^{1-0.1t}$

So

$$\int te^{1-0.1t} dt = t(-10e^{1-0.1t}) - 100e^{1-0.1t} + C = -10(t + 10)e^{1-0.1t} + C$$

hence

$$FV = 200(-10(t + 10)e^{1-0.1t}) \Big|_0^{10} = 200(-200 + 100e) = \$14365.$$