**Quiz #33**     Name: _____Key_____

### You must show your work to get full credit.

**1.** Let $f(x) = \dfrac{x^2 3^x}{2 + (1.5)^{x-1}}$. Find the average value of $f(x)$ on the interval $1 \leq x \leq 4$.

The average is _____

$$Av. = \frac{1}{(4-1)} \int_0^1 f(x)\,dx = fnInt\left(X\wedge2 * 3\wedge X / (2+(1.5)\wedge(X-1), X, 1, 4)\right)/3$$

**2.** Some review of topics that have been troublesome.

(a) Find the derivative of $f(x) = xe^{-ax}$ where $a$ is a constant.

$$f'(x) = 1e^{-ax} + xe^{-ax}(-a)$$
$$= e^{-ax}(1 - ax)$$
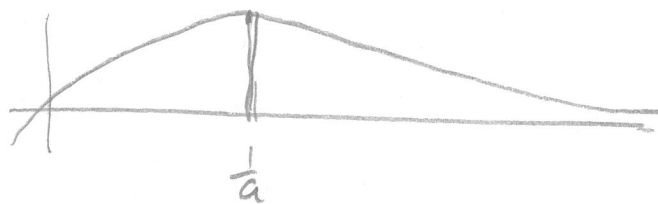
$f'(x) = \underline{(1-ax)e^{-ay}}$

(b) For $f(x) = xe^{-ax}$ find the maximizer and maximum for $x \geq 0$ and where $a > 0$ is constant.

$$\text{Set } f'(x) = (1-ax)e^{-ax} = 0$$

Maximizer is $\dfrac{1}{a}$

$$\text{Then } 1 - ax = 0$$
$$-ax = -1$$
$$x = \frac{1}{a}$$

Maximum is $\dfrac{1}{ae}$



$$f'(x) > 0 \text{ for } x < \tfrac{1}{a}$$
$$f'(x) < 0 \text{ for } x > \tfrac{1}{a}$$

$$maximum = f(\tfrac{1}{a})$$
$$= \frac{1}{a}e^{-a(\frac{1}{a})}$$
$$= \frac{1}{a}e^{-1} = \frac{1}{ae}$$