Complete the following tasks. You need to show work for full credit. In particular, for integrals, you may use resources like *Wolfram Alpha* to check your answers, but you need to show your work during Math 32 homework and exams. Some answers have been provided.

Assemble your work into one PDF document and upload the PDF back into our CatCourses page.

1. Compute each of the following antiderivatives. Show your work.
   (a) $\displaystyle\int e^{-x/32}\,dx$
   (b) $\displaystyle\int xe^{-x/32}\,dx$
   (c) $\displaystyle\int x^2e^{-x/32}\,dx$
2. Using your work from the previous problem, compute each of the following definite integrals.
   (a) $\displaystyle\int_0^\infty e^{-x/32}\,dx$
   (b) $\displaystyle\int_0^\infty xe^{-x/32}\,dx$
   (c) $\displaystyle\int_0^\infty x^2e^{-x/32}\,dx$
3. Compute the following definite integral. For this task, you may solely use software such as *Wolfram Alpha*.
$$\int_0^\infty x^3e^{-x/32}\,dx$$
4. The function $p(a)$ is defined for all real numbers a as
$$p(a) = \begin{cases} 1/36, & a = 1 \\ 3/36, & a = 2 \\ 5/36, & a = 3 \\ 7/36 & a = 4 \\ 9/36, & a = 5 \\ 11/36, & a = 6 \\ 0, & \text{otherwise.} \end{cases}$$
   (a) Sketch the graph of the function $p(a)$.
   (b) What are the values of $p(-0.5)$, $p(0)$, $p(2)$, $p(3.5)$, and $p(7)$?

5. Consider the function $f(x)$ defined for all real numbers x as

$$f(x) = \begin{cases} 3/4, & 0 \le x \le 1 \\ 1/8, & 2 \le x \le 4 \\ 0, & \text{otherwise} \end{cases}$$

   (a) Sketch the graph of f.

   (b) For each of the following definite integrals, sketch the graph with the correct area under the curve and compute the value.

   i. $\displaystyle\int_0^3 f(x)\,dx$

   ii. $\displaystyle\int_{-\infty}^1 f(x)\,dx$

   iii. $\displaystyle\int_{1.5}^{\infty} f(x)\,dx$

6. Solve for x

$$\frac{64}{3} = 16\log_{\sqrt{x}} 64 + 8\log_{\sqrt{x}} 64 + 4\log_{\sqrt{x}} 64 + \cdots$$

7. Compute the derivative of

$$y = \sqrt{\frac{x(x+2)}{(2x+1)(3x+2)}}$$

   (a) directly using the Chain and Product Rules

   (b) via logarithmic differentiation

Some answers

1.

2. (a) 32
   (b) 1024
   (c) 65536

3. 6291456

4. (a) (graph with 6 dots in a straight line)
   (b) $p(-0.5) = 0$, $p(0) = 0$, $p(2) = \dfrac{3}{36}$, $p(3.5) = 0$, $p(7) = 0$

5. (a) (two horizontal lines)
   (b) $\displaystyle\int_0^3 f(x)\,dx = \frac{7}{8}$, $\displaystyle\int_{-\infty}^1 f(x)\,dx = \frac{3}{4}$, $\displaystyle\int_{1.5}^{\infty} f(x)\,dx = \frac{1}{4}$

6. $x = 262144$

7.
   (a)
   (b)