

1. Find the derivative of each of the following functions.

(a) $f(x) = 7^{x^2-3x+2}$

(d) $f(x) = 2^x \log_2 \left| \frac{x^2 + 2x + 2}{2} \right|$

(b) $f(x) = (x + 3)2^x$

(e) $f(x) = \sqrt{1 + e^{2x}}$

(c) $f(x) = x \log(x + 1)$

(f) $f(x) = e^x \ln(x) + xe^{3x-1}$

2. Evaluate each of the following integrals.

(a) $\int_0^2 xe^{-x^2} dx$

(b) $\int \frac{4e^{\sqrt{x+5}}}{\sqrt{x+5}} dx$

(c) $\int 3^{4x+2} dx$

(e) $\int \left(\frac{1}{5}\right)^x dx$

(d) $\int \frac{2^{\frac{1}{x}}}{x^2} dx$

(f) $\int x^{\frac{1}{5}} dx$

3. Do #40 in section 7.4 (page 395). Round to the nearest degree Fahrenheit.

4. Do #34a,b, and c in section 7.4 (page 395).

5. (From the 200? AP Calculus AB exam) The twice-differentiable function f is defined for all real numbers and satisfies the following conditions:

$$f(0) = 2, f'(0) = -4, \text{ and } f''(0) = 3.$$

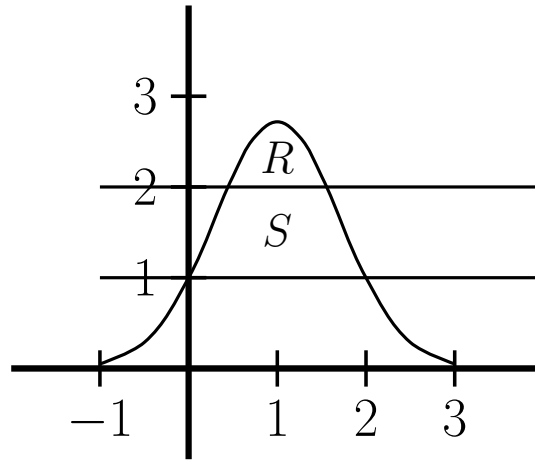
The function g is given by $g(x) = e^{ax} + f(x)$ for all real numbers, where a is a constant. Find $g'(0)$ and $g''(0)$ in terms of a . Show the work that leads to your answers.

6. (From the 200? AP Calculus AB exam) A particle moves along the x -axis with position at time t given by $x(t) = e^{-t} \sin(t)$ for $0 \leq t \leq 2\pi$.

(a) Find the time t at which the particle is farthest to the left. Justify your answer.

(b) Find the value of the constant A for which $x(t)$ satisfies the equation $Ax''(t) + x'(t) + x(t) = 0$ for $0 < t < 2\pi$.

7. (From the 2007 AP Calculus AB exam) Let R be the region bounded by the graph of $y = e^{2x-x^2}$ and the horizontal line $y = 2$, and let S be the region bounded by the graph of $y = e^{2x-x^2}$ and the horizontal lines $y = 1$ and $y = 2$, as shown below.



- (a) Set up, but do not evaluate, an integral expression that gives the area of R .
- (b) Set up, but do not evaluate, an integral expression that gives the area of S .
- (c) Set up, but do not evaluate, an integral expression that gives the volume of the solid generated when R is rotated about the horizontal line $y = 1$.