

6.7 EXERCISES

For the following exercises, find the derivative $\frac{dy}{dx}$.

295. $y = \ln(2x)$

296. $y = \ln(2x + 1)$

297. $y = \frac{1}{\ln x}$

For the following exercises, find the indefinite integral.

298. $\int \frac{dt}{3t}$

299. $\int \frac{dx}{1+x}$

For the following exercises, find the derivative dy/dx .

(You can use a calculator to plot the function and the derivative to confirm that it is correct.)

300. [T] $y = \frac{\ln(x)}{x}$

301. [T] $y = x \ln(x)$

302. [T] $y = \log_{10} x$

303. [T] $y = \ln(\sin x)$

304. [T] $y = \ln(\ln x)$

305. [T] $y = 7 \ln(4x)$

306. [T] $y = \ln((4x)^7)$

307. [T] $y = \ln(\tan x)$

308. [T] $y = \ln(\tan(3x))$

309. [T] $y = \ln(\cos^2 x)$

For the following exercises, find the definite or indefinite integral.

310. $\int_0^1 \frac{dx}{3+x}$

311. $\int_0^1 \frac{dt}{3+2t}$

312. $\int_0^2 \frac{x dx}{x^2 + 1}$

313. $\int_0^2 \frac{x^3 dx}{x^2 + 1}$

314. $\int_2^e \frac{dx}{x \ln x}$

315. $\int_2^e \frac{dx}{x (\ln x)^2}$

316. $\int \frac{\cos x dx}{\sin x}$

317. $\int_0^{\pi/4} \tan x dx$

318. $\int \cot(3x) dx$

319. $\int \frac{(\ln x)^2 dx}{x}$

For the following exercises, compute dy/dx by differentiating $\ln y$.

320. $y = \sqrt{x^2 + 1}$

321. $y = \sqrt{x^2 + 1} \sqrt{x^2 - 1}$

322. $y = e^{\sin x}$

323. $y = x^{-1/x}$

324. $y = e^{(ex)}$

325. $y = x^e$

326. $y = x^{(ex)}$

327. $y = \sqrt{x} \sqrt[3]{x} \sqrt[6]{x}$

328. $y = x^{-1/\ln x}$

329. $y = e^{-\ln x}$

For the following exercises, evaluate by any method.

$$330. \int_5^{10} \frac{dt}{t} - \int_{5x}^{10x} \frac{dt}{t}$$

$$331. \int_1^{e^\pi} \frac{dx}{x} + \int_{-2}^{-1} \frac{dx}{x}$$

$$332. \frac{d}{dx} \int_x^1 \frac{dt}{t}$$

$$333. \frac{d}{dx} \int_x^{x^2} \frac{dt}{t}$$

$$334. \frac{d}{dx} \ln(\sec x + \tan x)$$

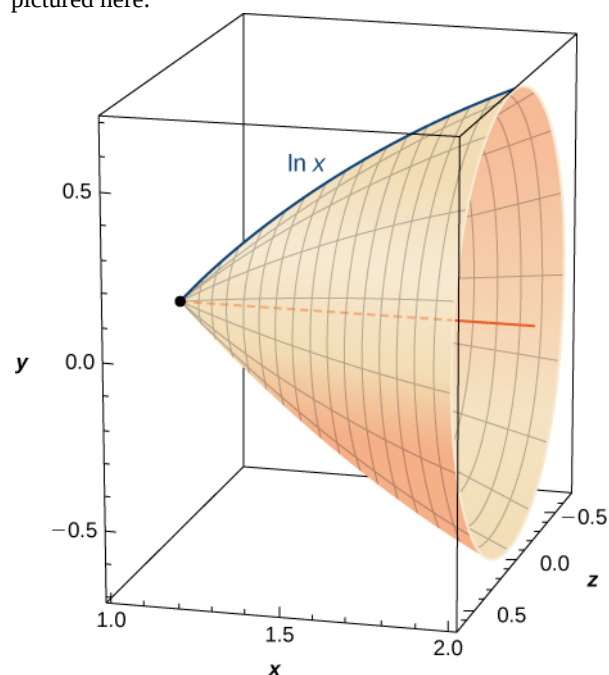
For the following exercises, use the function $\ln x$. If you are unable to find intersection points analytically, use a calculator.

335. Find the area of the region enclosed by $x = 1$ and $y = 5$ above $y = \ln x$.

336. [T] Find the arc length of $\ln x$ from $x = 1$ to $x = 2$.

337. Find the area between $\ln x$ and the x -axis from $x = 1$ to $x = 2$.

338. Find the volume of the shape created when rotating this curve from $x = 1$ to $x = 2$ around the x -axis, as pictured here.



339. [T] Find the surface area of the shape created when rotating the curve in the previous exercise from $x = 1$ to $x = 2$ around the x -axis.

If you are unable to find intersection points analytically in the following exercises, use a calculator.

340. Find the area of the hyperbolic quarter-circle enclosed by $x = 2$ and $y = 2$ above $y = 1/x$.

341. [T] Find the arc length of $y = 1/x$ from $x = 1$ to $x = 4$.

342. Find the area under $y = 1/x$ and above the x -axis from $x = 1$ to $x = 4$.

For the following exercises, verify the derivatives and antiderivatives.

$$343. \frac{d}{dx} \ln(x + \sqrt{x^2 + 1}) = \frac{1}{\sqrt{1 + x^2}}$$

$$344. \frac{d}{dx} \ln\left(\frac{x-a}{x+a}\right) = \frac{2a}{(x^2 - a^2)}$$

$$345. \frac{d}{dx} \ln\left(\frac{1 + \sqrt{1 - x^2}}{x}\right) = -\frac{1}{x\sqrt{1 - x^2}}$$

$$346. \frac{d}{dx} \ln(x + \sqrt{x^2 - a^2}) = \frac{1}{\sqrt{x^2 - a^2}}$$

$$347. \int \frac{dx}{x \ln(x) \ln(\ln x)} = \ln(\ln(\ln x)) + C$$