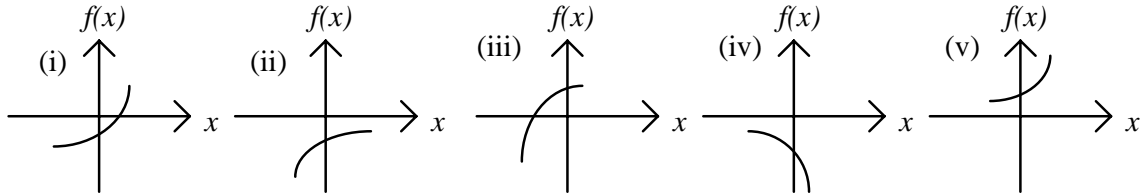


Show any work necessary to complete a problem.

1.) Which of the following graphs match the given information: \_\_\_\_\_

$$f(0) < 0, f'(0) > 0, f''(0) < 0$$



2.) (i) Use the first derivative to verify that  $(2, 3.457)$  is a critical point of

$$f(x) = \frac{3}{7}x^7 - \frac{2}{3}x^6 - \frac{11}{5}x^5 + \frac{7}{2}x^4 + \frac{1}{3}x^3 - \frac{3}{2}x^2 + 2x + 5$$

(ii) Determine what type of critical point  $(2, 3.457)$  is for  $f$  (i.e. max or min).

3.) Solve the following equations for  $x$ :

(a)  $\log_{27} x = 3$

(b)  $7^x = 50$

(c)  $\log_3(x-2) + \log_3 5 = 2$

- 4.) A man has \$10,000 to invest and is considering two possibilities:
- (a) A five-year certificate of deposit for which the annual rate of interest is 9.5% compounded monthly.
  - (b) A mutual fund specializing in corporate bonds paying 11% interest compounded semiannually. The fund charges an initial, one-time investment fee equal to 5% of the initial investment.

Assuming interest rates do not change, how much would each investment be worth at the end of five years?

- 5.) Solve for  $\frac{dy}{dx}$  in each of the following:

(a)  $y = \frac{e^x}{x}$

(b)  $y = \ln(5x^2)$

(c)  $xe^y = xy^2 + 2$

6.) Find the equation of the tangent line to the graph  $g(x) = \sqrt{\ln x}$  at  $x = e$ .

7.) Let  $P = \frac{9}{q^2}$  be a demand equation.

(i) Find the elasticity of demand ( $E(q)$ ).

(ii) Evaluate  $E(3)$ .

8.) A biology student requires a large culture of *Esherichia coli* bacteria for a DNA experiment. The number of cells  $N(t)$ , in millions, increases exponentially with the time  $t$ , in days according to the equation  $N(t) = 2e^t$

a) How many cells are in the culture when  $t = 3$ ?

b) How fast is the culture growing when  $t = 2$ ?

c) What is the relative rate of change of  $N(t)$ ?