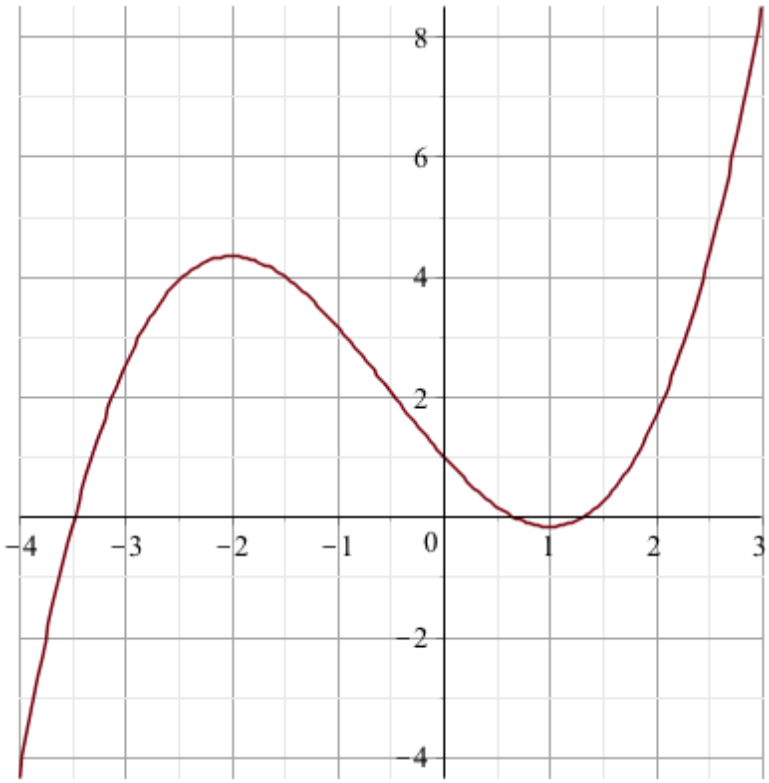
PRINTABLE VERSION

Practice Test 3

Question 1

The graph of $f(x)$ is shown. Find the x-value(s) where $f'(x) = 0$.



a) $x = -2$

b) $x = \{-2, 1\}$

c) $x = 0$

d) $x = \{-2, 0, 1\}$

e) $x = \{-2, 2\}$

Question 2

Find the intervals on which $f(x) = \dfrac{4x}{x^2 + 81}$ decreases.

a) $(-\infty, -9) \cup (9, \infty)$

b) $(-\infty, \infty)$

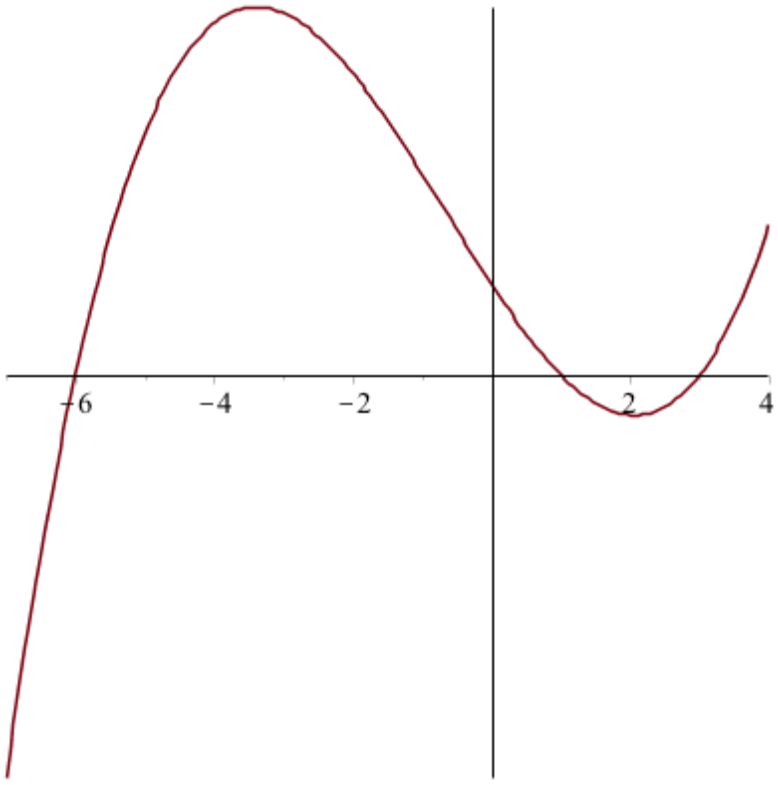
c) $(-\infty, -9) \cup (0, 9)$

d) $(9, \infty)$

e) $(-9, 9)$

Question 3

Suppose that $c = 1$ is a critical number for a function f. Determine if $f(c)$ is a local maximum, local minimum or neither if the graph of $f'(x)$ is shown below.



a) Local Minimum

b) Local Maximum

c) Neither

Question 4

Find the critical numbers of $f(x) = 2x^4 - 4x^2 + 1$ and classify all local extreme values.

a) Critical nos. ±1; local min $f(-1) = -1$; local max $f(1) = -1$.

b) Critical no. 0; local max $f(0) = 1$.

c) No critical numbers, no extreme values.

d) Critical nos. 0 and ±1; local min $f(-1) = -1$ and $f(1) = -1$; local max $f(0) = 1$.

e) Critical nos. ±1; local min $f(1) = -1$; local max $f(-1) = -1$.

Question 5

Find the critical numbers of $f(x) = 4x^2 + 2x + 1$ and classify all extreme values given $-1 \leq x \leq 0$.

a) Critical no. 0; local min $f(0) = 1$.

b) Critical no. $-\frac{1}{4}$; local and absolute min $f\left(-\frac{1}{4}\right) = \frac{3}{4}$; absolute max $f(-1) = 3$.

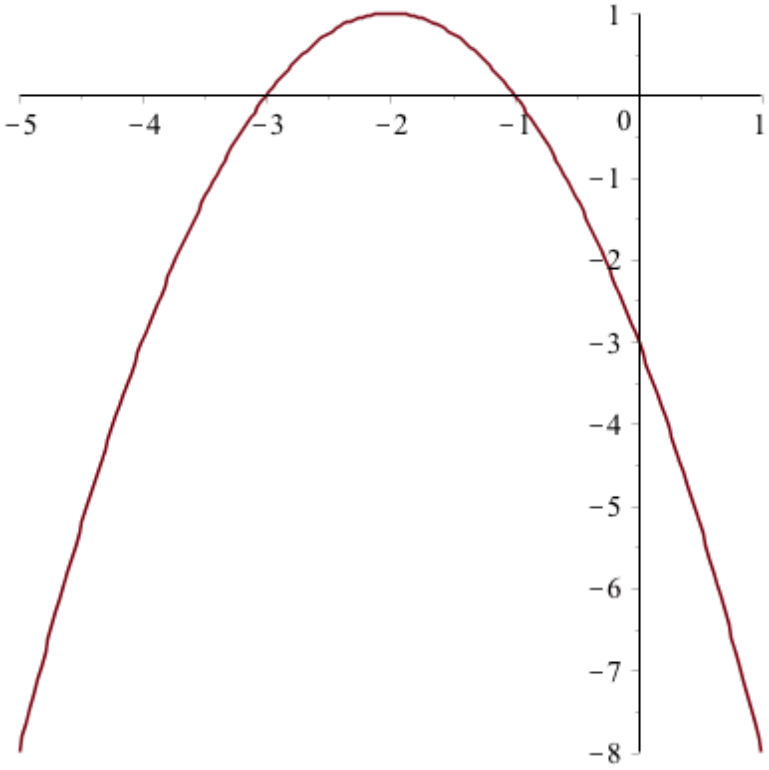
c) No critical numbers, no extreme values.

d) Critical nos. 0, $-\frac{1}{4}$; local and absolute min $f\left(-\frac{1}{4}\right) = \frac{3}{4}$; absolute max $f(0) = 1$.

e) Critical no. $-\frac{1}{4}$; local max $f\left(-\frac{1}{4}\right) = \frac{3}{4}$; no absolute extreme.

Question 6

Read Carefully! The graph of f' (the derivative of f) is shown below. Classify the smallest critical number for f.



a) local maximum

b) neither

c) local minimum

Question 7

Describe the concavity of the graph of $f(x) = \dfrac{2x}{9x^2 - 16}$ and find the points of inflection (if any).

a) concave down on $\left(-\infty, \frac{4}{3}\right)$; concave up on $\left(\frac{4}{3}, \infty\right)$; pt of inflection $\left(\frac{4}{3}, 0\right)$.

b) concave down on $(-\infty, \infty)$; no points of inflection

c) concave up on $(-\infty, 0)$; concave down on $(0, \infty)$; pt of inflection $(0, 0)$.

d) concave down on $\left(-\infty, -\frac{4}{3}\right)$ and $\left(0, \frac{4}{3}\right)$; concave up on $\left(-\frac{4}{3}, 0\right)$ and $\left(\frac{4}{3}, \infty\right)$; pt of inflection $(0, 0)$.

e) concave up on $\left(-\frac{4}{3}, \frac{4}{3}\right)$; concave down on $\left(-\infty, -\frac{4}{3}\right)$ and $\left(\frac{4}{3}, \infty\right)$; pts of inflection $\left(-\frac{4}{3}, 0\right)$ and $\left(\frac{4}{3}, 0\right)$.

Question 8

Find c so that the graph of $f(x) = cx^2 - 4x^{-2}$ has a point of inflection at $(4, f(4))$.

a) $c = \frac{3}{64}$

b) $c = \frac{3}{32}$

c) $c = -\frac{3}{64}$

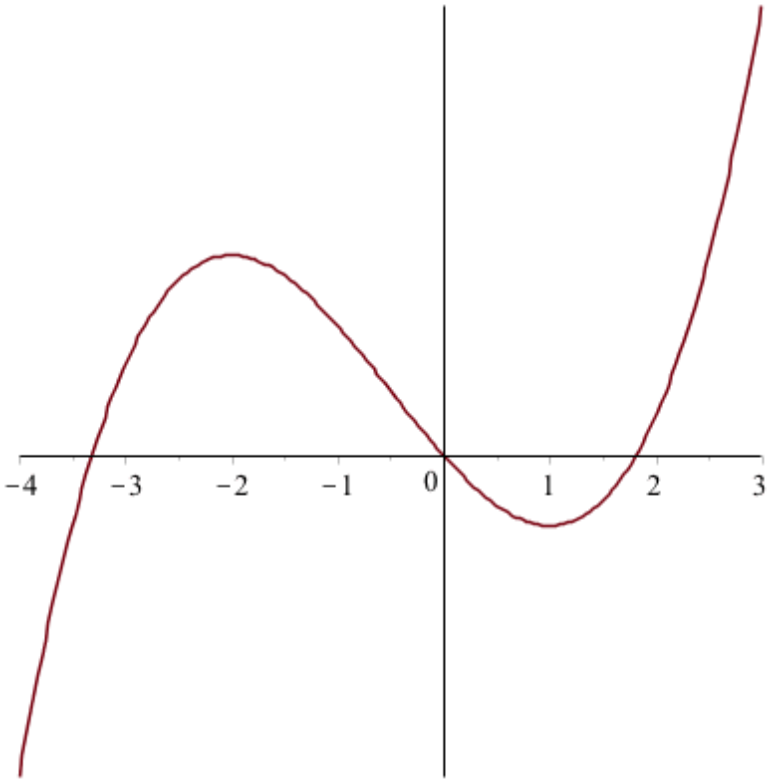
d) $c = 0$

e) $c = -\frac{3}{32}$

Question 9

The graph of $f'(x)$ is shown below. Give the interval(s) where the graph of

$f(x)$ is concave up.



a) $(-2, 1)$

b) $(-\infty, 0)$ and $(1, \infty)$

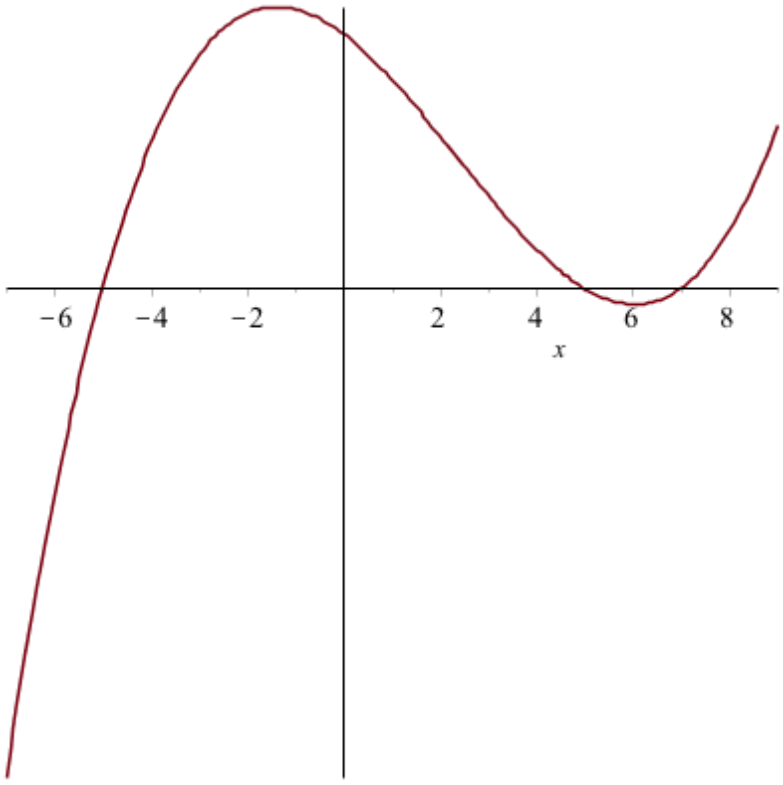
c) $(0, \infty)$

d) $(-\infty, 0)$

e) $(-\infty, -2)$ and $(1, \infty)$

Question 10

Given the graph of $f'(x)$ below, where is $f(x)$ increasing?



a) $f(x)$ is increasing on the interval $(-5, \infty)$.

b) $f(x)$ is increasing on the intervals $(-\infty - 5)$ and $(5, 7)$.

c) $f(x)$ is increasing on the interval $(-\infty, 7)$.

d) $f(x)$ is increasing on the intervals $(-5, 5)$ and $(7, \infty)$.

e) $f(x)$ is increasing on the interval $(-5, 7)$.

Question 11

Find the vertical and horizontal asymptotes of $f(x) = \dfrac{2x}{2x - 3}$.

a) vertical asymptote: $x = \frac{3}{2}$; no horizontal asymptote.

b) vertical asymptote: $x = 1$; horizontal asymptote: $y = \frac{3}{2}$.

c) vertical asymptote: $x = \frac{3}{2}$; horizontal asymptote: $y = 0$.

d) vertical asymptote: $x = \frac{3}{2}$; horizontal asymptote: $y = 1$.

e) no vertical asymptote; horizontal asymptote: $y = 1$.

Question 12

Determine whether or not the graph of $f(x) = 2(x-4)^{4/5}$ has a vertical tangent or vertical cusp at $x = 4$.

a) vertical tangent

b) vertical cusp

c) both

d) neither

Question 13

Which of the following is true about the graph of $f(x) = 27x^2 + \frac{54}{x} - 4$?

a) $f(x)$ has a point of inflection at the point $(0, -4)$.

b) $f(x)$ is concave down on the interval $(0, \infty)$.

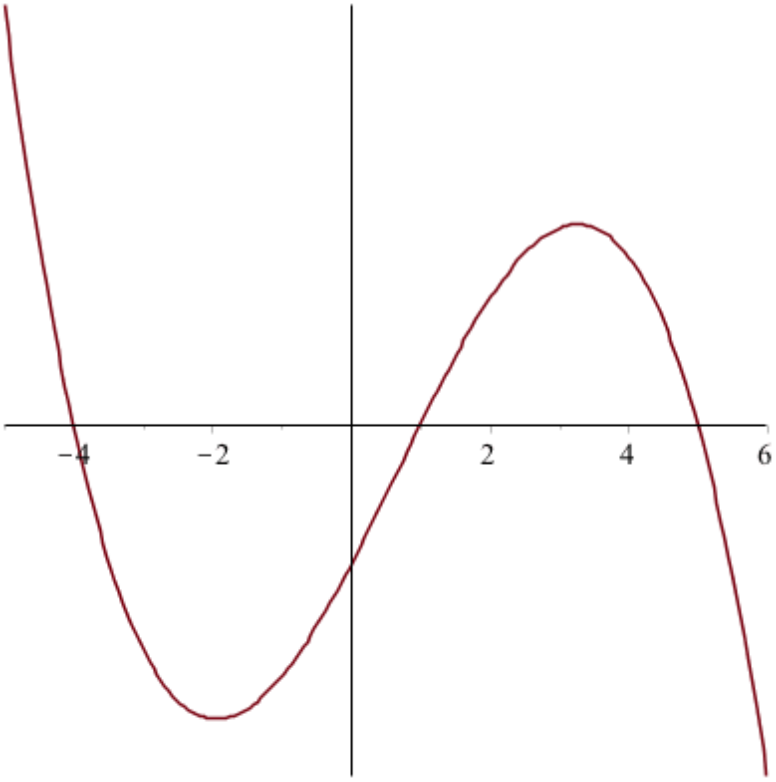
c) $f(x)$ has a vertical asymptote at $x = 54$.

d) $f(x)$ has a local minimum at the point $(1, 77)$.

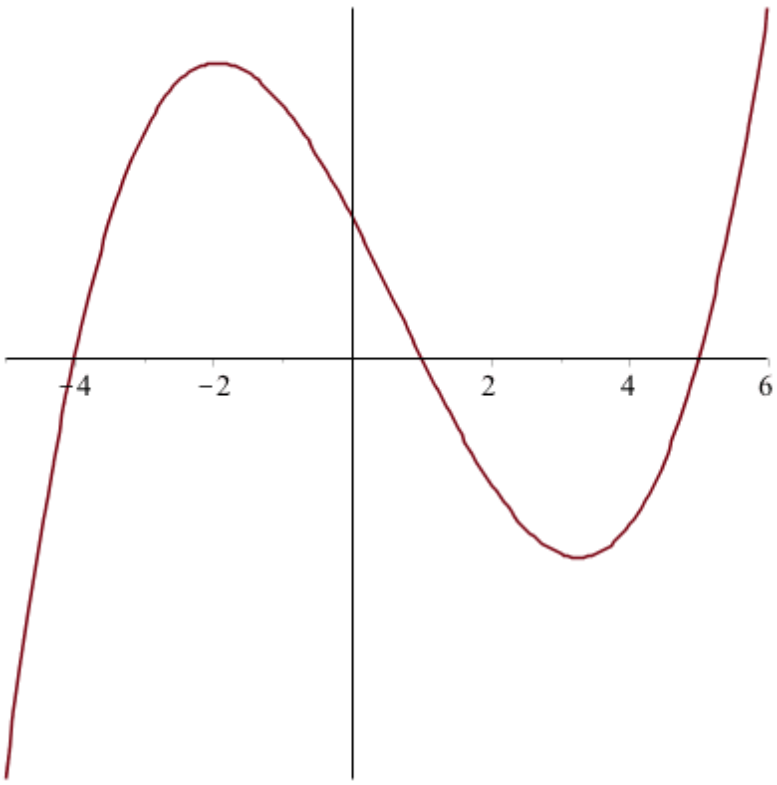
e) $f(x)$ is increasing on the interval $(-\infty, 0)$.

Question 14

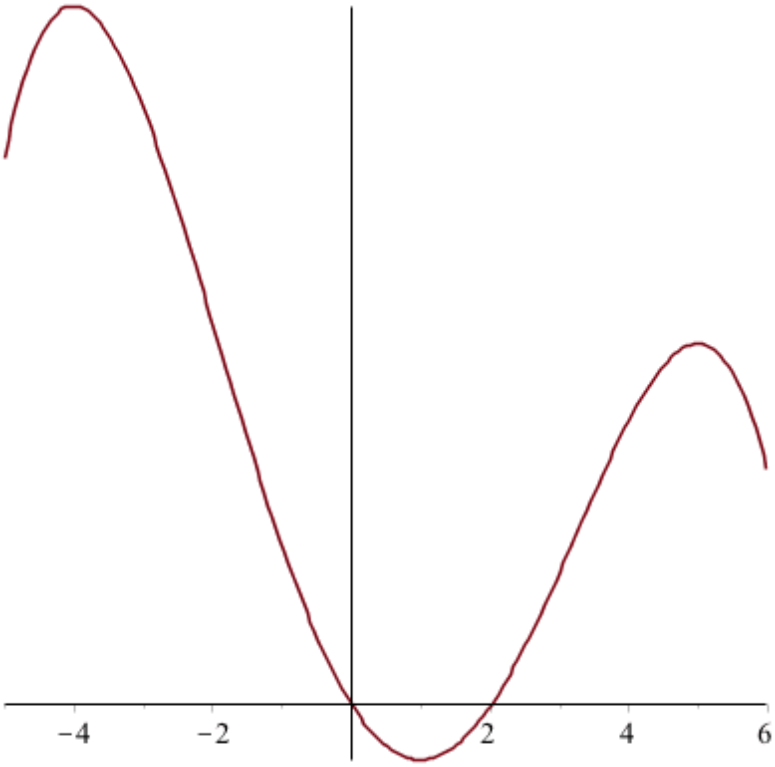
The graph of $f'(x)$ is shown below. Which of the following could represent the graph of $f(x)$?



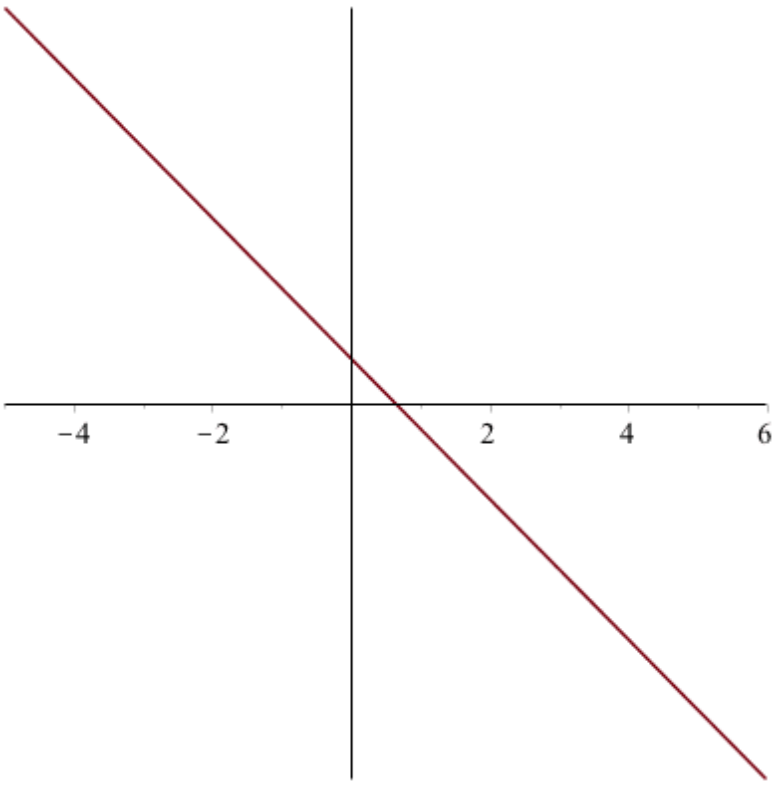
a)



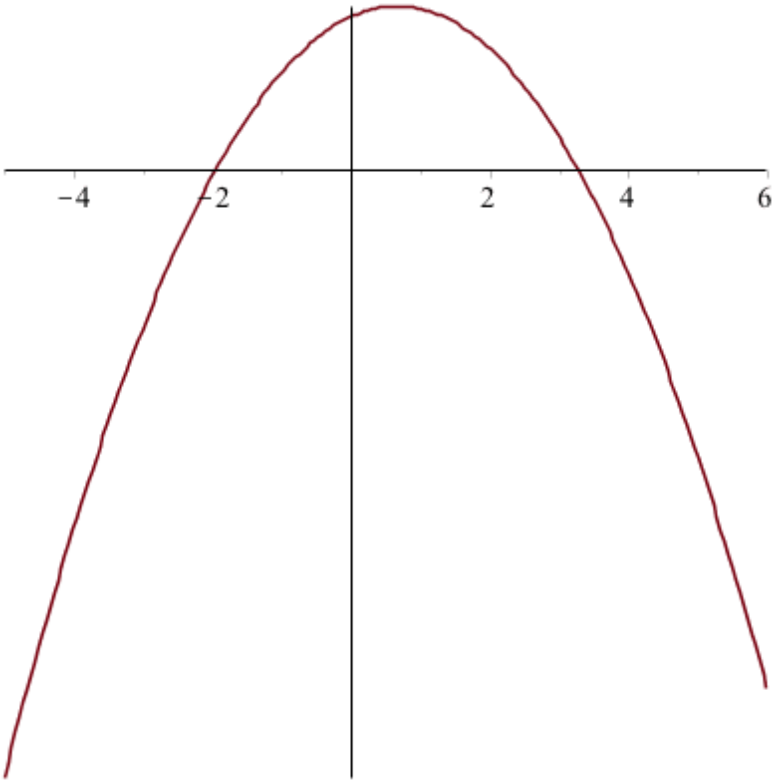
b)



c)



d)



Question 15

Determine whether or not the given function is one-to-one and, if so, find the inverse. If $f(x) = 6x - 2$ has an inverse, give the domain of f^{-1}.

a) Not one-to-one.

b) $f^{-1}(x) = 6x + 2$; domain: $(-\infty, -2)$

c) $f^{-1}(x) = \frac{1}{6}x + \frac{1}{3}$; domain: $(-\infty, \infty)$

d) $f^{-1}(x) = 6x - 2$; domain: $(-\infty, \infty)$

e) $f^{-1}(x) = -\frac{1}{6}x - \frac{1}{3}$; domain: $(-2, \infty)$

Question 16

Suppose that f has an inverse and $f(-2) = 3$, $f'(-2) = \frac{6}{7}$. What is $\left(f^{-1}\right)'(3)$?

a) $\frac{7}{6}$

b) $\frac{13}{6}$

c) $-\frac{6}{7}$

d) $\frac{6}{7}$

e) $\frac{7}{3}$

Question 17

Suppose that $f(x) = 3x^3 + 6$ is differentiable and has an inverse and $f(4) = 198$. Find $\left(f^{-1}\right)'(198)$.

a) $\frac{1}{72}$

b) $-\frac{1}{144}$

c) 288

d) 144

e) $\frac{1}{144}$

Question 18

Suppose that $f(x) = 2x + 2\pi + \cos(x)$ is differentiable and has an inverse for $0 < x < 2\pi$ and $f(1\pi) = 4\pi - 1$. Find $\left(f^{-1}\right)'(4\pi - 1)$.

a) -1

b) $\frac{1}{2}$

c) $\frac{1}{4}$

d) $-\frac{1}{2}$

e) 1

Question 19

Differentiate: $y = 4\,x\mathrm{e}^{2\,x^3}$

a) $y' = 4\,\mathrm{e}^{2\,x^3} + 4\,x\mathrm{e}^{2\,x^3}$

b) $y' = 4\,\mathrm{e}^{2\,x^3} + 24\,x^3\mathrm{e}^{2\,x^3}$

c) $y' = 4\,\mathrm{e}^{2\,x^3}$

d) $y' = 4\,\mathrm{e}^{6\,x^2}$

e) $y' = \mathrm{e}^{2\,x^3} + 6\,x^3\mathrm{e}^{2\,x^3}$

Question 20

Differentiate: $y = \ln\left(2\,x^2 + 3\right)$

a) $y' = -\dfrac{4\,x}{\left(2\,x^2 + 3\right)^2}$

b) $y' = \dfrac{2}{2\,x^2 + 3}$

c) $y' = \dfrac{4\,x}{2\,x^2 + 3}$

d) $y' = -\dfrac{1}{\left(2\,x^2 + 3\right)^2}$

e) $y' = \dfrac{1}{2\,x^2 + 3}$