SPECIALIST MATHEMATICS

MC EXAM QUESTIONS

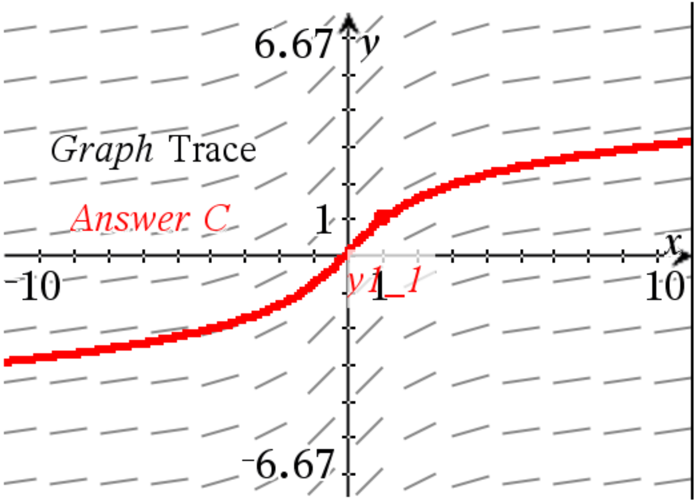
Euler's Method graphically, using euler from catalogue and using euler in notes page.

$\frac{dy}{dx}=\frac{1}{\sqrt{x^2+1}}$, with $y=1$ when $x=1$.

Using Euler's method with a step size of 0.1, the approximate value of y when x=1.2, correct to 3 dp, is:

A. 1.140

B. 1.071 C. 1.138



$$\text{euler}\left(\frac{1}{\sqrt{x^2+1}},x,y,\{1,1.2\},1,0.1\right)$$

$$\begin{bmatrix} 1. & 1.1 & 1.2 \\ 1. & 1.07071 & 1.13798 \end{bmatrix}$$

The features of the graph of the function

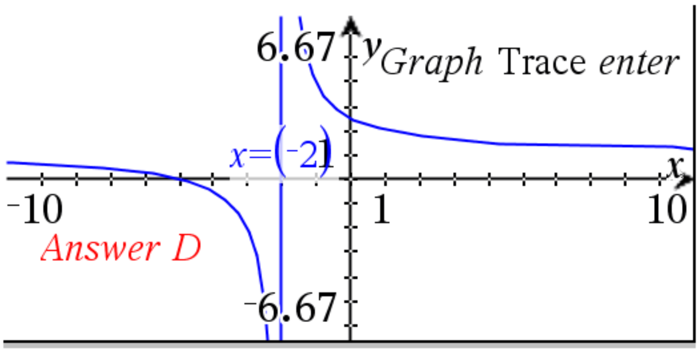
with rule $f(x)=\frac{x^2+4x-5}{x^2+x-2}$ include

A. asymptotes at x=1 and x=−2

B. asymptotes at x=1 and x=−5

C. an asymptote at x=1 and a point of discontinuity at x=−2

D. an asymptote at x=−2 and a point of discontinuity at x=1



$f1(1)$ undef

The asymptotes of the hyperbola given by $\frac{(x-2)^2}{4}-\frac{y^2}{9}=1$ intersect the coordinate axes at

A. (0,−4.5),(0,4.5),(2,,0)

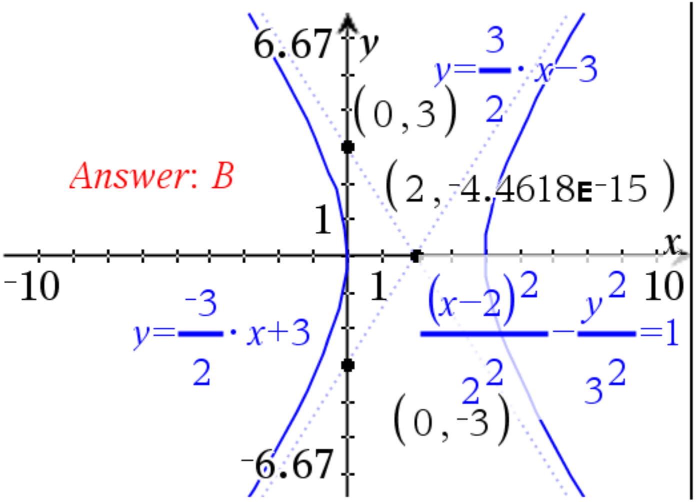
B. (0,2),(0,−2),(3,0)

C. (0,2),(0,−2),(−3,0)

$\text{factor}(f(x))$ $\quad \frac{x+5}{x+2}$

$\text{expand}\left(\frac{x+5}{x+2}\right)$ $\quad \frac{3}{x+2}+1$

$\text{factor}(x^2+x-2)$ $\quad (x-1)\cdot(x+2)$



The ellipse given by $3x^2-12x+y^2-2y+12=0$ has centre, length of horizontal semi−axis and length of vertical semi−axis respectively of

A. (2,1), 1, 3

B. (2,1), $\frac{1}{3}$,1

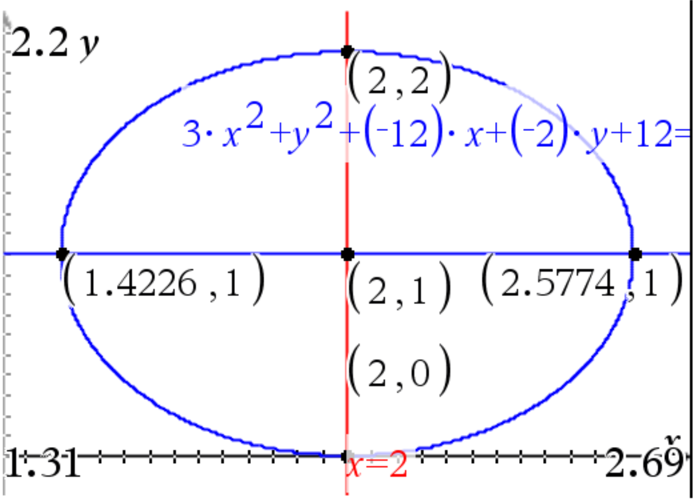
$\text{completeSquare}(3\cdot x^2-12\cdot x+y^2-2\cdot$

$3\cdot(x-2)^2+(y-1)^2=1$

©centre(2,1)

©$a=\frac{1}{\sqrt{3}}$, b=1

©Answer E



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A body moves in a straight line such that its velocity v m/s is given by $v=(1-x)^2$, where x metres is its displacement from the origin. If the body starts at the origin, its acceleration after 2 seconds is

A. $-\frac{2}{27}ms^{-2}$ B. $-\frac{1}{4}ms^{-2}$ C.

$\frac{d^2}{dt^2}\left(\frac{t}{t+1}\right)$ $\frac{-2}{(t+1)^3}$

$\frac{-2}{(t+1)^3}|t=2$ $\frac{-2}{27}$

©Answer A

A particle moves in a straight line such that its acceleration is given by $a=\sqrt{v^2-4}$, where v is its velocity and x is its displacement from a fixed point. Given that $v=2$ when x=1, the velocity in terms of x is:

A. $v=\sqrt{x+2}$ B. $v=1+|x+2|$ C.

$\sqrt{v^2-4}=x-1$

$\text{solve}\left(\sqrt{v^2-4}=x-1,v\right)$

$v=-\sqrt{x^2-2\cdot x+5}$ and $x\geq 1$ or $v=\sqrt{x^2-}$▸

©Answer D

If $\frac{dy}{dx}=\sqrt{\left(x^3-1\right)^5}$ and y=3 when x=1, then the value of y when x=2 is given by

A. $\int_1^2 \left(\sqrt{\left(x^3-1\right)^5}+3\right)dx$

$\text{deSolve}\left(y'=\sqrt{\left(x^3-1\right)^5} \text{ and } y(1)=3,x\right.$ ▸

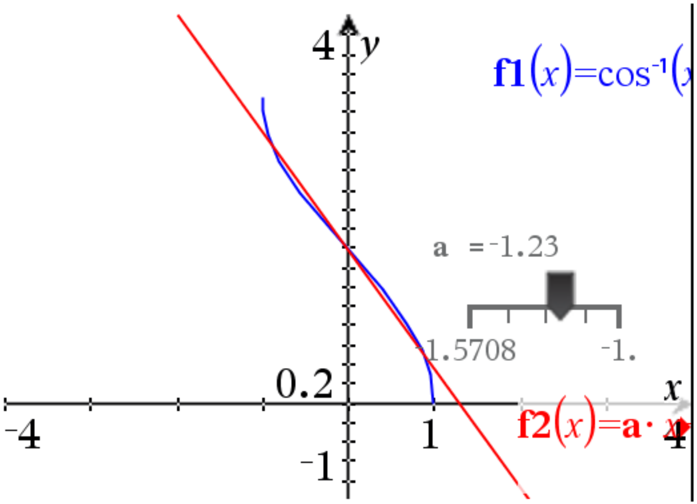
$$y=\int_1^x \sqrt{\left(c2^3-1\right)^5}\, d(c2)+3$$

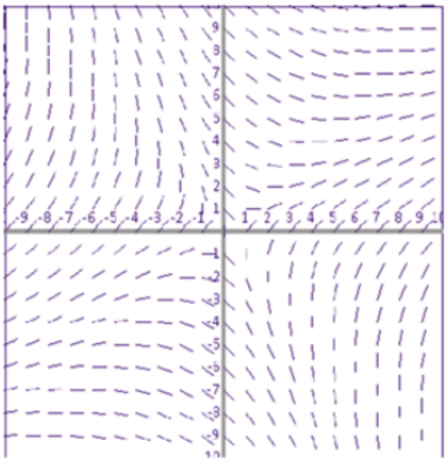
©Answer C

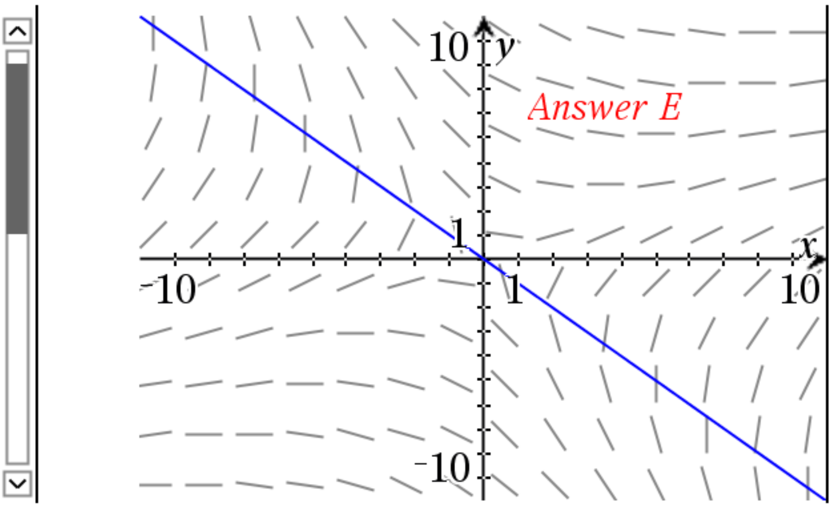
The graph of $y = ax + \frac{\pi}{2}$ intersects with the graph of $y = arcos(x)$ exactly three times if

A. $-\frac{\pi}{2} \leq \mathbf{a} < -1$

B. $-\frac{\pi}{2} \leq \mathbf{a} \leq 1$






10
y
Answer E
1
-10
1
x
10
-10

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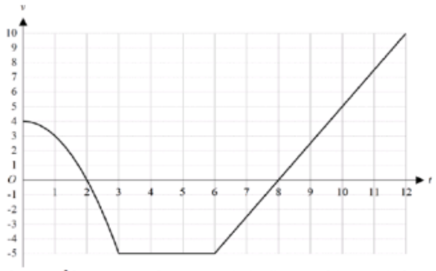
The velocity–time graph below shows the motion of a particle travelling in a straight line, where v ms^{-1} is its velocity at time t seconds.



If $v = 4 - t^2$ for $0 \le t < 3$, after 12 seconds the distance of the particle from its starting point is

A. 3 m
B. 10 m
1

3−3· 5	-12
-12−0.5· 5· 2	-17.
-17.+0.5· 4· 10	3.

©Answer A

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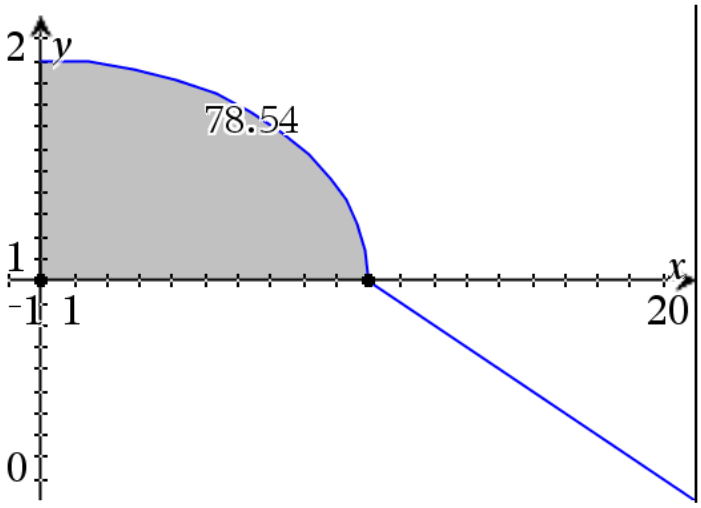
The velocity, m/s, of a particle at time t seconds is given by:

Define $\mathbf{v}(t)=\begin{cases}\sqrt{100-t^2}, & 0\le t\le 10\\ 10-t, & t>0\end{cases}$

▸ *Done*

If the particle starts at the origin, the time at which it returns to the origin, in seconds, is:



2

$\text{solve}\left(\frac{-m^2}{2}+10\cdot m-50=-78.5398163\right.$▸

$m=-2.53314$ or $m=22.5331$

©Answer B

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A particle moves in a straight line and, at time t seconds, its displacement from a fixed origin is x metres. If $a=\frac{1}{t^2+1}$ and v=0 when t = 0, its average velocity in the third second of its motion, in m/s, is closest to:

$v=\tan^{-1}(t)$

$\int_2^3 \tan^{-1}(t)\, dt$ 1.18627

©Answer C

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A curve is defined by $x^2-3\cdot x\cdot y+y^2=5$. There are two points on the curve where the gradient of the tangent to the curve is equal to 2. The coordinates of the points are

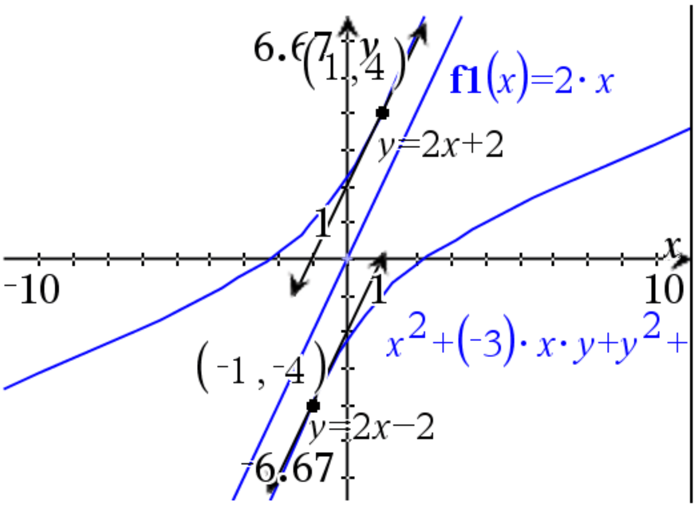
A. $(-1,4),(1,-4)$ B. $(1,4),(-1,4)$ C. $(-1,1),(1,-1)$ D.

impDif$(x^2-3\cdot x\cdot y+y^2=5,x,y)$

$$\frac{2\cdot x-3\cdot y}{3\cdot x-2\cdot y}$$

solve$\left(\dfrac{2\cdot x-3\cdot y}{3\cdot x-2\cdot y}=2 \text{ and } x^2-3\cdot x\cdot y+y\right.$▸

$x=^-1$ and $y=^-4$ or $x=1$ and $y=4$



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A particle starts from the origin and moves in a straight line with velocity given by $\mathbf{v}(t)=\begin{cases} t+1, & 0\le t\le 2 \\ 2t-\dfrac{t^2}{4}, & 2<t<12 \end{cases}$

The distance covered by the particle in the first 12 secons of its motion is

Define $v(t)=\begin{cases} \ldots \\ 2\cdot t-\dfrac{t^2}{4}, 2<t<12 \end{cases}$

Done

$\int_0^{12} |v(t)|\, dt \qquad \dfrac{130}{3}$

©Answer B