Use an appropriate Taylor series to approximate the given value, accurate to within 10^{-8}.
sin 1.43

Using the first three terms of the sine series around the center $\pi/2$ we get
$\sin 1.43 \approx 0.99010456$.

Maclaurin

$$\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!}$$

Taylor Series center $\pi/2$

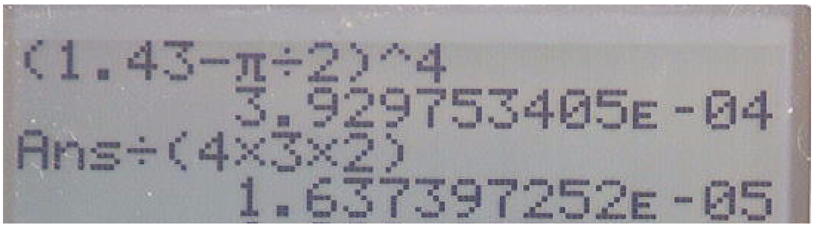
$f(x) = \sin x \quad f(\pi/2) = 1$

$f'(x) = \cos x \quad f'(\pi/2) = 0$

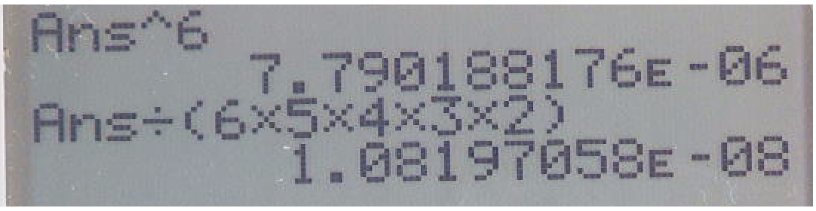
$f''(x) = -\sin x \quad f''(\pi/2) = -1$

$$\sin(x) = 1 - \frac{(x-\pi/2)^2}{2!} + \frac{(x-\pi/2)^4}{4!} -$$

$$1 - \frac{(1.43-\pi/2)^2}{2!} + \frac{(1.43-\pi/2)^4}{4!}$$



$$\frac{(1.43-\pi/2)^6}{6!}$$



Use a known Taylor series to conjecture the value of the given limit.

$$\lim_{x \to 0} \frac{\sin x^2 - x^2}{x^8}$$

$$\sin x^2 = x^2 - \frac{x^6}{3!} + \frac{x^{10}}{5!} - \frac{x^{14}}{7!}$$

$$\frac{\sin x^2 - x^2}{x^8} = \frac{-\frac{x^6}{3!} + \frac{x^{10}}{5!} - \frac{x^{14}}{7!}}{x^8}$$

$$\lim_{x \to 0} \frac{-\frac{x^6}{3!}}{x^8} = \frac{-1}{6x^2}$$ goes to $-\infty$

Kathleen

Use a known Taylor polynomial with n nonzero terms to estimate the value of the integral.

$$\int_{-\sqrt{2\pi}}^{\sqrt{2\pi}} 9\cos x^2 \, dx,\ n = 4$$

Round your answer to two decimal places.

Your Answer:

$$\cos(x) = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!}$$

$$\cos(x^2) = 1 - \frac{(x^2)^2}{2!} + \frac{(x^2)^4}{4!} - \frac{(x^2)^6}{6!}$$

$$\int 9\cos(x^2)dx = 9\left(x - \frac{x^5}{10} + \frac{x^9}{9 \times 4!} - \frac{x^{13}}{6! \times 13}\right)$$

evaluate at $\sqrt{2\pi}$

$$9\left(\sqrt{2\pi} - \frac{\sqrt{2\pi}^5}{10} + \frac{\sqrt{2\pi}^9}{9 \times 4!} - \frac{\sqrt{2\pi}^{13}}{6! \times 13}\right)$$

$$\int_{-\sqrt{2\pi}}^{\sqrt{2\pi}} 9\cos x^2 \, dx = 18\int_0^{\sqrt{2\pi}} \cos x^2 \, dx$$

$$\approx 18\int_0^{\sqrt{2\pi}} \left(1 - \frac{x^4}{2} + \frac{x^8}{24} - \frac{x^{12}}{720}\right) dx$$

$$\approx 18\left(x - \frac{x^5}{10} + \frac{x^9}{216} - \frac{x^{13}}{9360}\right)\Bigg|_0^{\sqrt{2\pi}}$$

$\approx$ $\boxed{-104.04 \text{ Rounded to two decimal places}}$

Jenna ♡

Use the Binomial Theorem to find the first five terms of the Maclaurin series.

$f(x) = \sqrt[3]{1+3x}$

$$\sqrt[3]{1+3x} = (1+3x)^{1/3}$$
$$= 1 + \frac{1}{3}(3x) - \frac{1}{9}(3x)^2 + \frac{5}{81}(3x)^3 - \frac{10}{243}(3x)^4 + \frac{22}{729}(3x)^5 + \ldots$$
$$= 1 + x - x^2 + \frac{5}{3}x^3 - \frac{10}{3}x^4 + \frac{22}{3}x^5 + \ldots$$

$y = (1+x)^{1/3} \quad y(0) = 1$

$y' = \frac{1}{3}(1+x)^{-2/3} \quad y'(0) = \frac{1}{3}$

$y'' = -\frac{2}{9}(1+x)^{-5/3} \quad y''(0) = -\frac{2}{9}$

$y''' = \frac{10}{27}(1+x)^{-8/3} \quad y'''(0) = \frac{10}{27}$

$(1+x)^{1/3} = 1 + \frac{1}{3}x - \frac{2}{9}\frac{x^2}{2} + \frac{10}{27}\frac{x^3}{3!}$

Find parametric equations for the line segment joining the points (6, 9) and (10, 15).

- A. $x = 6 + 4t,\ y = 9 - 6t$, for $0 \le t \le 1$
- B. $x = t,\ y = 9 + 6t$, for $0 \le t \le 1$
- C. $x = 6 + 4t,\ y = 9 + 6t$, for $0 \le t \le \pi$
- D. $x = 6 + 4t,\ y = 9 + 6t$, for $0 \le t \le 1$

$x(0) = 6 \quad x(1) = 10$

$y(0) = 9 \quad y(1) = 15$

Function $y(x)$ pass VLT.

Parametric

$x(t) = 6 + 4t$

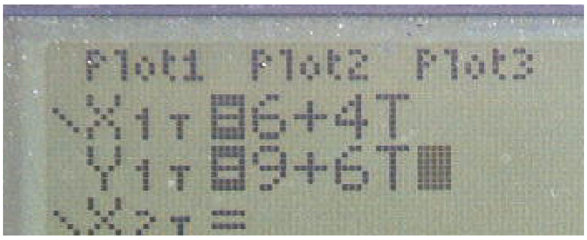
$y(t) = 9 + 6t$

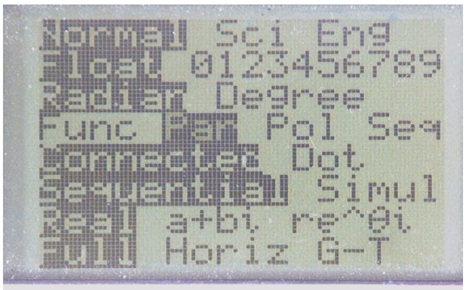
$0 \le t \le 1$

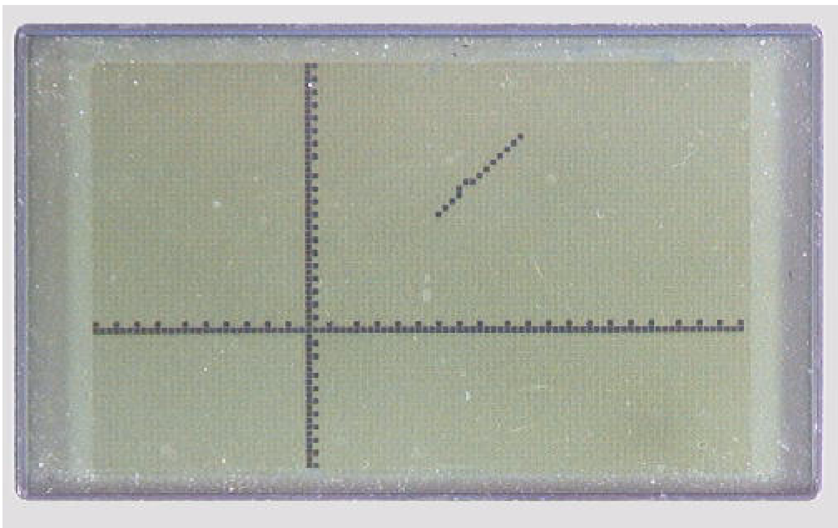
$x(t) = 6 + 40t$

$y(t) = 9 + 60t$

$0 \le t \le \frac{1}{10}$

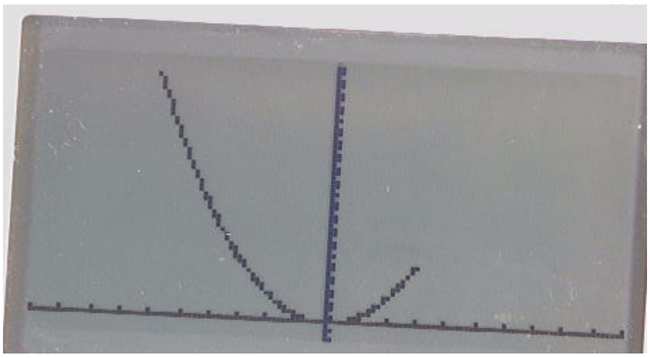


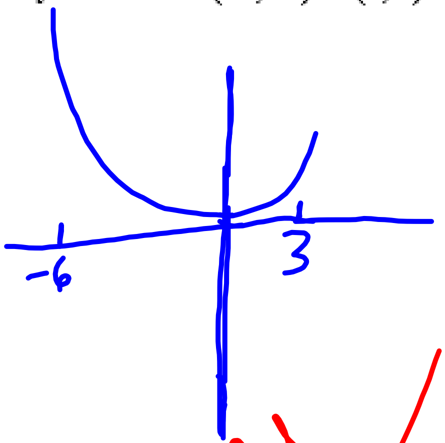




Find parametric equations for the portion of the parabola $y = x^2$ from $(-6, 36)$ to $(3, 9)$.

$x = \boxed{t}$ $\quad y = \boxed{t^2}$, $\quad -6 \le t \le 3$





Simplify your answer.

Sketch the plane curve defined by the given parametric equations and find a corresponding x–y equation for the curve.

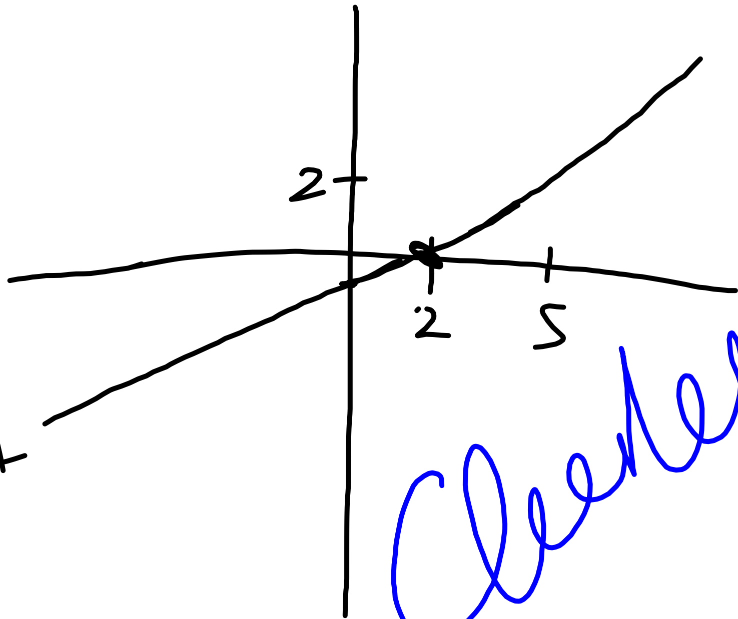
$x = 2 + 3t$

$y = 2t$

$y = \boxed{\frac{2}{3}}\,x - \boxed{\frac{4}{3}}$

$$\frac{x-2}{3} = t$$

$$y = \frac{2x-4}{3}$$



Checks

Find parametric equations for the line segment joining the points $(-7, 5)$ and $(8, 9)$.

- A. $x = 5 + 4t$, $y = -7 + 15t$, for $0 \le t \le \pi$.
- B. $x = -7 + 15t$, $y = 5 + 4t$, for $0 \le t \le 1$.
- C. $x = -7 + 15t$, $y = 5 + 4t$, for $0 \le t \le \pi$.
- D. $x = 5 + 4t$, $y = -7 + 15t$, for $0 \le t \le 1$.

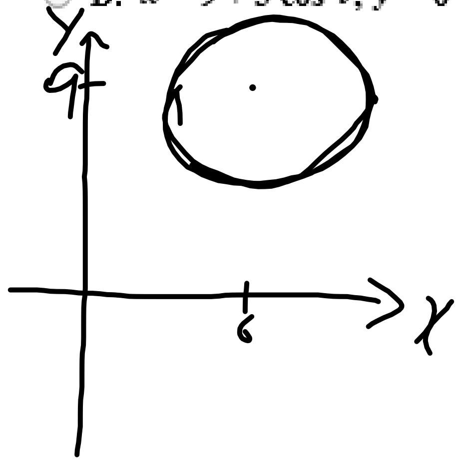
$x(0) = -7$ $\quad y(0) = 5$

$x(1) = 8$ $\quad y(1) = 9$

Jason

Find parametric equations describing the circle of radius 3 centered at (6, 9), drawn counterclockwise.

- A. $x = 9 + 3\cos t$, $y = 6 + 3\sin t$, for $0 \le t \le 2$.
- B. $x = 6 + 3\cos t$, $y = 9 + 3\sin t$, for $0 \le t \le 2$.
- ✓ C. $x = 6 + 3\cos t$, $y = 9 + 3\sin t$, for $0 \le t \le \underline{2\pi}$.
- D. $x = 9 + 3\cos t$, $y = 6 + 3\sin t$, for $0 \le t \le 2\pi$.



Jim

flight path given by the parametric equations

$x = 250t$, $y = 70t - 14t^2$, for $0 \le t \le 5$.

FINAL QUESTION

Two minutes later, you fire an interceptor missile from your location following the flight path

$x = 500 - 200(t-2)$, $y = 80(t-2) - 16(t-2)^2$, for $2 \le t \le 7$.

Determine whether the interceptor missile hits its target.

- A. The interceptor missile hits its target.
- B. The interceptor missile misses its target.

$$500 - 200(t-2) = 250t$$
$$500 - 200t + 400 = 250t$$
$$900 = 450t$$
$$t = 2$$

$70(2) - 14(2)^2$ $\quad$ $80(2-2) - 16(2-2)^2$

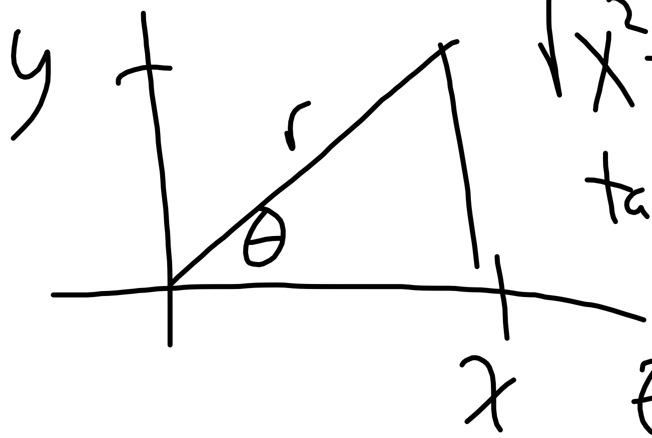
$140 - 56$ $\quad$ 0

84

$84 \neq 0$ TDF

Polar Coordinates

$$(x, y) \to (r, \theta)$$



$$\sqrt{x^2+y^2} = r$$

$$\tan\theta = y/x$$

$$\theta = \tan^{-1}(y/x)$$

dy/dx for Parametrics

$$\frac{dy/dt}{dx/dt}$$

Ex

$x = 3 + 2t$

$y = 5 - 8t$

$dy/dx = -8/2$