Assignment 1

The due date for submitting this assignment has passed. **Due on 2018-09-05, 23:59 IST.**
As per our records you have not submitted this assignment.

(A) Which of the following functions are positive definite? (Write "TRUE" for positive-definite, otherwise "FALSE")

1) \( V(x_1, x_2) = 2x_1^2 + x_2^2 + 2x_1x_2 \)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(=Type: String) True

2) \( V(x_1, x_2) = x_1^2 + (x_1 - x_2)^2 \)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(=Type: String) True

3) \( V(x_1, x_2) = x_1^2 + x_2^2 \)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(=Type: String) True

4) \( V(x_1, x_2) = x_1^2 + e^{-x_2^2} \)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(=Type: String) True
5. A differentiable function $f(t)$ is bounded ($\mathcal{L}_\infty$) implies that its derivative $f'(t)$ is also bounded ($\mathcal{L}_\infty$).

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: String) False

6. A function $f(t)$ is square-integrable ($\mathcal{L}_2$) implies that $f(t) \to 0$ as $t \to \infty$.

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: String) False

7. There exist functions such that $f(t) \to 0$ as $t \to \infty$, but its derivative $f'(t)$ does not converge as $t \to \infty$.

(C) Given a system $\dot{x}(t) = f(x(t))$ where $f(0) = 0$, which of the following statements are true. (State “TRUE” or “FALSE”.)

8. The equilibrium point $x = 0$ is stable if $\forall \delta > 0, \exists \varepsilon(\delta) > 0$ s.t. $\|x(0)\| \leq \delta \Rightarrow \|x(t)\| \leq \varepsilon, \forall \ t > 0$

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: String) False

9. The equilibrium point $x = 0$ is stable if $\forall \varepsilon > 0, \exists \delta(\varepsilon) > 0$ s.t. $\|x(0)\| \leq \delta \Rightarrow \|x(t)\| \leq \varepsilon, \forall \ t > 0$

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: String) True

10. The state $x(t)$ is bounded if $\forall \delta > 0, \exists \delta(\delta) > 0$ s.t. $\|x(0)\| \leq \delta \Rightarrow \|x(t)\| \leq \delta, \forall \ t > 0$

No, the answer is incorrect.
Score: 0
Accepted Answers:
Choose the correct option from below.

The origin is Lyapunov stable.
The origin is asymptotically stable.
The solution \( x(t) \) is uniformly ultimately bounded.
None of the above.

No, the answer is incorrect.
Score: 0
Accepted Answers:
The solution \( x(t) \) is uniformly ultimately bounded.

Within which of the following regions, the origin of the system given below, is stable?

\[ x \in [-1,1] \]
\[ x \in (-1,1) \]
\[ x \in (-\infty,\infty) \]
None of these

No, the answer is incorrect.
Score: 0
Accepted Answers:
\[ x \in [-1,1] \]

Within which of the following regions, the origin of the following system is asymptotically stable?

\[ x = x^3 - x \]

\[ x \in [-1,1] \]
\[ x \in (-1,1) \]
\[ x \in (-\infty,\infty) \]
None of these

No, the answer is incorrect.
Score: 0
Accepted Answers:
\[ x \in (-1,1) \]

For the system given below, which of the following natures of stability are true for the origin of the system given as

\[ x(t) = \frac{-x(t)}{1 + t}, t \geq 0 \]
Globally uniformly stable
Globally Stable
Globally asymptotically stable
Globally uniformly asymptotically stable

No, the answer is incorrect.
Score: 0
Accepted Answers:
Globally asymptotically stable