2022Call3.

(1) **Q1**

CLOZE | 0.10 penalty

If not specified otherwise, fill in the blanks with **integers (possibly 0 or negative)**. A fraction should be **reduced** (for example, $\frac{1}{2}$ is accepted but not $\frac{2}{4}$), and if it is negative and the answer boxes (such as $\frac{\boxed{a}}{\boxed{b}}$) have ambiguity, the negative sign should be put on the numerator (for example $\frac{-1}{2}$ is accepted but $\frac{1}{-2}$ is not). $\log x = \log_e x$, not $\log_{10} x$.

Complete the formulae.

$$(x+1)^{\frac{1}{2}} = \boxed{a} + \frac{\boxed{b}}{\boxed{c}}x + \frac{\boxed{d}}{\boxed{e}}x^2 + \frac{\boxed{f}}{\boxed{g}}x^3 \text{ as } x \to 0.$$

$\boxed{a}$:

NUMERICAL | 1 point

1 ✓	

$\boxed{b}$:

NUMERICAL | 1 point

1 ✓	

$\boxed{c}$:

NUMERICAL | 1 point

2 ✓	

$\boxed{d}$:

NUMERICAL | 1 point

-1 ✓	

$\boxed{e}$:

NUMERICAL | 1 point

8 ✓	

$\boxed{f}$:

NUMERICAL | 1 point

1 ✓	

$\boxed{g}$:

NUMERICAL | 2 points

16 ✓	

$$(x-1)\exp x = \boxed{\text{h}} + \boxed{\text{i}}x + \frac{\boxed{\text{j}}}{\boxed{\text{k}}}x^2 + \frac{\boxed{\text{l}}}{\boxed{\text{m}}}x^3 + o(x^3) \text{ as } x \to 0.$$

$\boxed{\text{h}}$:

NUMERICAL | 1 point

-1 ✓	

$\boxed{\text{i}}$:

NUMERICAL | 1 point

0 ✓	

$\boxed{\text{j}}$:

NUMERICAL | 1 point

1 ✓	

$\boxed{\text{k}}$:

NUMERICAL | 2 points

2 ✓	

$\boxed{\text{l}}$:

NUMERICAL | 1 point

1 ✓	

$\boxed{\text{m}}$:

NUMERICAL | 2 points

3 ✓	

$$\sin(x^2)\cdot x = \boxed{\text{o}} + \boxed{\text{p}}x + \boxed{\text{q}}x^2 + \boxed{\text{r}}x^3 + o(x^3) \text{ as } x \to 0.$$

$\boxed{\text{o}}$:

NUMERICAL | 3 points

0 ✓	

$\boxed{\text{p}}$:

NUMERICAL | 1 point

0 ✓	

$\boxed{\text{q}}$:

NUMERICAL | 1 point

0 ✓	

$\boxed{\text{r}}$:

NUMERICAL | 3 points

1 ✓	

For various $\alpha, \beta \in \mathbb{R}$, study the limit:

$$\lim_{x\to 0} \frac{(x+1)^{\frac{1}{2}} + (x-1)\exp x + \alpha x + \beta x^2}{\sin(x^2)\cdot x}.$$

This limit converges for $\alpha = \frac{\boxed{\text{s}}}{\boxed{\text{t}}}$, $\beta = \frac{\boxed{\text{u}}}{\boxed{\text{v}}}$.

$\boxed{\text{s}}$:

NUMERICAL | 4 points

-1 ✓	

$\boxed{\text{t}}$:

NUMERICAL | 4 points

2 ✓	

$\boxed{\text{u}}$:

NUMERICAL | 4 points

-3 ✓	

$\boxed{\text{v}}$:

NUMERICAL | 4 points

8 ✓	

In that case, the limit is $\frac{\boxed{\text{w}}}{\boxed{\text{x}}}$.

$\boxed{\text{w}}$:

NUMERICAL | 4 points

19 ✓	

$\boxed{\text{x}}$:

NUMERICAL | 4 points

48 ✓	

(2) **Q1**

CLOZE | 0.10 penalty

If not specified otherwise, fill in the blanks with **integers (possibly 0 or negative)**. A fraction should be **reduced** (for example, $\frac{1}{2}$ is accepted but not $\frac{2}{4}$), and if it is negative and the answer boxes (such as $\frac{\boxed{\text{a}}}{\boxed{\text{b}}}$) have ambiguity, the negative sign should be put on the numerator (for example $\frac{-1}{2}$ is accepted but $\frac{1}{-2}$ is not). $\log x = \log_e x$, not $\log_{10} x$.

Complete the formulae.

$$(1-x)^{\frac{1}{2}} = \boxed{\text{a}} + \frac{\boxed{\text{b}}}{\boxed{\text{c}}}x + \frac{\boxed{\text{d}}}{\boxed{\text{e}}}x^2 + \frac{\boxed{\text{f}}}{\boxed{\text{g}}}x^3 \text{ as } x \to 0.$$

a:

NUMERICAL | 1 point

1 ✓	

b:

NUMERICAL | 1 point

-1 ✓	

c:

NUMERICAL | 1 point

2 ✓	

d:

NUMERICAL | 1 point

-1 ✓	

e:

NUMERICAL | 1 point

8 ✓	

f:

NUMERICAL | 1 point

-1 ✓	

g:

NUMERICAL | 2 points

16 ✓	

$$(1+x)\exp x = \boxed{\text{h}} + \boxed{\text{i}}x + \frac{\boxed{\text{j}}}{\boxed{\text{k}}}x^2 + \frac{\boxed{\text{l}}}{\boxed{\text{m}}}x^3 + o(x^3) \text{ as } x \to 0.$$

h:

NUMERICAL | 1 point

1 ✓	

i:

NUMERICAL | 1 point

2 ✓	

j:

NUMERICAL | 1 point

3 ✓	

k:

NUMERICAL | 2 points

2 ✓	

l:

NUMERICAL | 1 point

2 ✓	

m:

NUMERICAL | 2 points

3 ✓	

$\sin(5x^2) \cdot x =$ [o] $+$ [p] $x +$ [q] $x^2 +$ [r] $x^3 + o(x^3)$ as $x \to 0$.

o:

NUMERICAL | 3 points

0 ✓	

p:

NUMERICAL | 1 point

0 ✓	

q:

NUMERICAL | 1 point

0 ✓	

r:

NUMERICAL | 3 points

5 ✓	

For various $\alpha, \beta \in \mathbb{R}$, study the limit:

$$\lim_{x \to 0} \frac{(1-x)^{\frac{1}{2}} - (1+x)\exp x + \alpha x + \beta x^2}{\sin(5x^2) \cdot x}.$$

This limit converges for $\alpha = \frac{[s]}{[t]}, \beta = \frac{[u]}{[v]}$.

s:

NUMERICAL | 4 points

5 ✓	

t:

NUMERICAL | 4 points

2 ✓	

u:

NUMERICAL | 4 points

13 ✓	

v:

NUMERICAL | 4 points

8 ✓	

In that case, the limit is $\frac{\boxed{\text{w}}}{\boxed{\text{x}}}$.

$\boxed{\text{w}}$:

NUMERICAL | 4 points

-7 ✓	

$\boxed{\text{x}}$:

NUMERICAL | 4 points

48 ✓	

(3) **Q2**

CLOZE | 0.10 penalty

If not specified otherwise, fill in the blanks with **integers (possibly 0 or negative)**. A fraction should be **reduced** (for example, $\frac{1}{2}$ is accepted but not $\frac{2}{4}$), and if it is negative and the answer boxes (such as $\frac{\boxed{\text{a}}}{\boxed{\text{b}}}$) have ambiguity, the negative sign should be put on the numerator (for example $\frac{-1}{2}$ is accepted but $\frac{1}{-2}$ is not). $\log x = \log_e x$, not $\log_{10} x$.

Let us study the following series $\sum_{n=0}^{\infty} \frac{3^n-1}{2^n}(x+1)^n$, with various x.

This series makes sense also for $x \in \mathbb{C}$. For $x = i$, calculate the partial sum $\sum_{n=0}^{2} \frac{3^n-1}{2^n}(x+1)^n = \boxed{\text{a}} + \boxed{\text{b}} i$.

$\boxed{\text{a}}$:

NUMERICAL | 1 point

1 ✓	

$\boxed{\text{b}}$:

NUMERICAL | 1 point

5 ✓	

In order to discuss the convergence using the root test for $x \in \mathbb{R}$, we put $a_n = \frac{3^n-1}{2^n}|x+1|^n$. Complete the formula.

$$\lim_{n\to\infty} (a_n)^{\frac{1}{n}} = \frac{\boxed{\text{c}}}{\boxed{\text{d}}}|x + \boxed{\text{e}}|^{\boxed{\text{f}}}.$$

$\boxed{\text{c}}$:

NUMERICAL | 1 point

3 ✓	

$\boxed{\text{d}}$:

NUMERICAL | 1 point

2 ✓	

e:

NUMERICAL 1 point

1 ✓	

f:

NUMERICAL 1 point

1 ✓	

Therefore, by the ratio test, the series converges absolutely for

MULTI 2 points Single

- all x.
- $-3 < x < -1$.
- $-3 < x < 1$.
- $-\frac{5}{3} < x < -\frac{1}{3}$. ✓
- $-\frac{3}{2} < x < -\frac{1}{2}$.
- $\frac{1}{3} < x < \frac{5}{3}$.
- $\frac{1}{2} < x < \frac{3}{2}$.
- $-1 < x < 1$.
- $-1 < x < 3$.
- $x = 0$.
- $1 < x < 3$.

For the case $x = -\frac{3}{2}$, the series

MULTI 2 points Single

- converges absolutely. ✓
- converges but not absolutely.
- diverges.

For the case $x = 1$, the series

MULTI 2 points Single

- converges absolutely.
- converges but not absolutely.
- diverges. ✓

(4) **Q2**

CLOZE 0.10 penalty

If not specified otherwise, fill in the blanks with **integers (possibly** 0 **or negative)**. A fraction should be **reduced** (for example, $\frac{1}{2}$ is accepted but not $\frac{2}{4}$), and if it is negative and the answer boxes (such as $\frac{\boxed{a}}{\boxed{b}}$) have ambiguity, the negative sign should be put on the numerator (for example $\frac{-1}{2}$ is accepted but $\frac{1}{-2}$ is not). $\log x = \log_e x$, not $\log_{10} x$.

Let us study the following series $\sum_{n=0}^{\infty} \frac{3^n-1}{2^n}(x-1)^n$, with various x.

This series makes sense also for $x \in \mathbb{C}$. For $x = i$, calculate the partial sum $\sum_{n=0}^{2} \frac{3^n-1}{2^n}(x-1)^n = \boxed{\text{a}} + \boxed{\text{b}}i$.

$\boxed{\text{a}}$:

NUMERICAL | 1 point

-1 ✓	

$\boxed{\text{b}}$:

NUMERICAL | 1 point

-3 ✓	

In order to discuss the convergence using the root test for $x \in \mathbb{R}$, we put $a_n = \frac{3^n-1}{2^n}|x-1|^n$. Complete the formula.

$$\lim_{n\to\infty} (a_n)^{\frac{1}{n}} = \frac{\boxed{\text{c}}}{\boxed{\text{d}}}|x + \boxed{\text{e}}|^{\boxed{\text{f}}}.$$

$\boxed{\text{c}}$:

NUMERICAL | 1 point

3 ✓	

$\boxed{\text{d}}$:

NUMERICAL | 1 point

2 ✓	

$\boxed{\text{e}}$:

NUMERICAL | 1 point

-1 ✓	

$\boxed{\text{f}}$:

NUMERICAL | 1 point

1 ✓	

Therefore, by the ratio test, the series converges absolutely for

MULTI | 2 points | Single

- all x.
- $-3 < x < -1$.
- $-3 < x < 1$.
- $-\frac{5}{3} < x < -\frac{1}{3}$.
- $-\frac{3}{2} < x < -\frac{1}{2}$.
- $\frac{1}{3} < x < \frac{5}{3}$. ✓
- $\frac{1}{2} < x < \frac{3}{2}$.
- $-1 < x < 1$.
- $-1 < x < 3$.

- $x = 0$.
- $1 < x < 3$.

For the case $x = -\frac{3}{2}$, the series

MULTI | 2 points | Single

- converges absolutely.
- converges but not absolutely.
- diverges. ✓

For the case $x = \frac{1}{3}$, the series

MULTI | 2 points | Single

- converges absolutely.
- converges but not absolutely.
- diverges. ✓

(5) **Q3**

CLOZE | 0.10 penalty

If not specified otherwise, fill in the blanks with **integers (possibly 0 or negative)**. A fraction should be **reduced** (for example, $\frac{1}{2}$ is accepted but not $\frac{2}{4}$), and if it is negative and the answer boxes (such as $\frac{\boxed{a}}{\boxed{b}}$) have ambiguity, the negative sign should be put on the numerator (for example $\frac{-1}{2}$ is accepted but $\frac{1}{-2}$ is not). $\log x = \log_e x$, not $\log_{10} x$.

Let us consider the following function

$$f(x) = \log \frac{x^2 + 1}{x + 2}.$$

The function $f(x)$ is not defined on the whole real line $\mathbb{R}$. Choose all the points that are **not** in the natural domain of $f(x)$.

MULTI | 4 points | Single

- -2 ✓
- -1 (-100%)
- $-\frac{1}{2}$ (-100%)
- 0 (-100%)
- $\frac{1}{2}$ (-100%)
- 1 (-100%)
- 2 (-100%)

Choose all asymptotes of $f(x)$.

MULTI | 4 points | Single

- $y = -1$ (-100%)
- $y = -\frac{1}{2}$ (-100%)
- $y = 0$ (-100%)

- $y = \frac{1}{2}$ (−100%)
- $y = 2$ (−100%)
- $x = -2$ ✓
- $x = -1$ (−100%)
- $x = -\frac{1}{2}$ (−100%)
- $x = 0$ (−100%)
- $x = \frac{1}{2}$ (−100%)
- $x = 1$ (−100%)
- $x = 2$ (−100%)
- $y = x + 3$ (−100%)
- $y = x + 1$ (−100%)
- $y = x - 1$ (−100%)
- $y = x - 3$ (−100%)

One has

$$f'(1) = \frac{\boxed{\text{a}}}{\boxed{\text{b}}}.$$

$\boxed{\text{a}}$:

NUMERICAL | 4 points

2 ✓	

$\boxed{\text{b}}$:

NUMERICAL | 4 points

3 ✓	

The function $f(x)$ has $\boxed{\text{c}}$ stationary point(s) in the domain

$\boxed{\text{c}}$:

NUMERICAL | 4 points

1 ✓	

Choose the behaviour of $f(x)$ in the interval $(0, 2)$.

MULTI | 4 points | Single

- monotonically decreasing
- monotonically increasing
- neither decreasing nor increasing ✓

(6) **Q3**

CLOZE | 0.10 penalty

If not specified otherwise, fill in the blanks with **integers (possibly 0 or negative)**. A fraction should be **reduced** (for example, $\frac{1}{2}$ is accepted but not $\frac{2}{4}$), and if it is negative and the answer boxes (such as $\frac{\boxed{\text{a}}}{\boxed{\text{b}}}$) have ambiguity, the negative sign should be put on the numerator (for example $\frac{-1}{2}$ is accepted but $\frac{1}{-2}$ is not). $\log x = \log_e x$, not $\log_{10} x$.

Let us consider the following function

$$f(x) = \log \frac{x^2+1}{x-2}.$$

The function $f(x)$ is not defined on the whole real line $\mathbb{R}$. Choose all the points that are **not** in the natural domain of $f(x)$.

MULTI | 4 points | Single

- -2 (-100%)
- -1 (-100%)
- $-\frac{1}{2}$ (-100%)
- 0 (-100%)
- $\frac{1}{2}$ (-100%)
- 1 (-100%)
- 2 ✓

Choose all asymptotes of $f(x)$.

MULTI | 4 points | Single

- $y = -1$ (-100%)
- $y = -\frac{1}{2}$ (-100%)
- $y = 0$ (-100%)
- $y = \frac{1}{2}$ (-100%)
- $y = 2$ (-100%)
- $x = -2$ (-100%)
- $x = -1$ (-100%)
- $x = -\frac{1}{2}$ (-100%)
- $x = 0$ (-100%)
- $x = \frac{1}{2}$ (-100%)
- $x = 1$ (-100%)
- $x = 2$ ✓
- $y = x + 3$ (-100%)
- $y = x + 1$ (-100%)
- $y = x - 1$ (-100%)
- $y = x - 3$ (-100%)

One has

$$f'(3) = \frac{\boxed{\text{a}}}{\boxed{\text{b}}}.$$

a:

NUMERICAL | 4 points

-2 ✓	

b:

NUMERICAL | 4 points

5 ✓	

The function $f(x)$ has [c] stationary point(s) in the domain

[c]:

NUMERICAL 4 points

1 ✓	

Choose the behaviour of $f(x)$ in the interval $(2, 3)$.

MULTI 4 points Single

- monotonically decreasing ✓
- monotonically increasing
- neither decreasing nor increasing

(7) **Q4**

CLOZE 0.10 penalty

If not specified otherwise, fill in the blanks with **integers (possibly** 0 **or negative)**. A fraction should be **reduced** (for example, $\frac{1}{2}$ is accepted but not $\frac{2}{4}$), and if it is negative and the answer boxes (such as $\frac{\boxed{a}}{\boxed{b}}$) have ambiguity, the negative sign should be put on the numerator (for example $\frac{-1}{2}$ is accepted but $\frac{1}{-2}$ is not). $\log x = \log_e x$, not $\log_{10} x$.

Let us calculate the following integral.

$$\int_1^2 \frac{1}{2^x + 3 + 2(2^{-x})} dx.$$

Let us change the variables $2^x = t$. Complete the formula

$$\int_1^2 \frac{1}{2^x + 3 + 2(2^{-x})} dx = \int_{\boxed{a}}^{\boxed{b}} \frac{1}{\log \boxed{c}(t^2 + \boxed{d}t + \boxed{e})} dt$$

[a]:

NUMERICAL 1 point

2 ✓	

[b]:

NUMERICAL 1 point

4 ✓	

[c]:

NUMERICAL 2 points

2 ✓	

[d]:

NUMERICAL 1 point

3 ✓	

[e]:

NUMERICAL | 1 point

2 ✓	

By continuing, we get

$$\int_1^2 \frac{1}{2^x + 3 + 2(2^{-x})} dx = \frac{\log \frac{\boxed{f}}{\boxed{g}}}{\log \boxed{i}}.$$

[f]:

NUMERICAL | 2 points

10 ✓	

[g]:

NUMERICAL | 2 points

9 ✓	

[h]:

NUMERICAL | 2 points

2 ✓	

(8) **Q4**

CLOZE | 0.10 penalty

If not specified otherwise, fill in the blanks with **integers (possibly 0 or negative)**. A fraction should be **reduced** (for example, $\frac{1}{2}$ is accepted but not $\frac{2}{4}$), and if it is negative and the answer boxes (such as $\frac{\boxed{a}}{\boxed{b}}$) have ambiguity, the negative sign should be put on the numerator (for example $\frac{-1}{2}$ is accepted but $\frac{1}{-2}$ is not). $\log x = \log_e x$, not $\log_{10} x$.

Let us calculate the following integral.

$$\int_1^3 \frac{1}{2^x + 3 + 2(2^{-x})} dx.$$

Let us change the variables $2^x = t$. Complete the formula

$$\int_1^3 \frac{1}{2^x + 3 + 2(2^{-x})} dx = \int_{\boxed{a}}^{\boxed{b}} \frac{1}{\log \boxed{c} (t^2 + \boxed{d} t + \boxed{e})} dt$$

[a]:

NUMERICAL | 1 point

2 ✓	

[b]:

NUMERICAL | 1 point

8 ✓	

c:

NUMERICAL | 2 points

2 ✓	

d:

NUMERICAL | 1 point

3 ✓	

e:

NUMERICAL | 1 point

2 ✓	

By continuing, we get

$$\int_1^3 \frac{1}{2^x + 3 + 2(2^{-x})} dx = \frac{\log \frac{\boxed{\text{f}}}{\boxed{\text{g}}}}{\log \boxed{\text{i}}}.$$

f:

NUMERICAL | 2 points

6 ✓	

g:

NUMERICAL | 2 points

5 ✓	

h:

NUMERICAL | 2 points

2 ✓	

(9) **Q5**

CLOZE | 0.10 penalty

If not specified otherwise, fill in the blanks with **integers (possibly 0 or negative)**. A fraction should be **reduced** (for example, $\frac{1}{2}$ is accepted but not $\frac{2}{4}$), and if it is negative and the answer boxes (such as $\frac{\boxed{\text{a}}}{\boxed{\text{b}}}$) have ambiguity, the negative sign should be put on the numerator (for example $\frac{-1}{2}$ is accepted but $\frac{1}{-2}$ is not). $\log x = \log_e x$, not $\log_{10} x$.

Choose the general solution of the following differential equation.

$$y'(x) = -y(x)^2 \cos(x^2)x.$$

MULTI | 2 points | Single

- $y(x) = \sin(x^2)/2 + C$
- $y(x) = \cos(x^2)/2 + C$
- $y(x) = \sin(x^2 + C)/2$
- $y(x) = \cos(x^2 + C)/2$
- $y(x) = \log(\sin(x^2)/2) + C$
- $y(x) = \log(\cos(x^2)/2) + C$
- $y(x) = \log(\sin(x^2)/2 + C)$
- $y(x) = \log(\cos(x^2)/2 + C)$
- $y(x) = 1/(\sin(x^2)/2 + C)$ ✓
- $y(x) = 1/(\sin(x^2))/2 + C$

Determine $C =$ [a] with the initial condition $y(0) = 1$

[a]:

NUMERICAL 2 points

1 ✓	

Choose the general solution of the following differential equation.

$$y''(x) - 2y'(x) - 8y(x) = 0.$$

MULTI 2 points Single

- $y(x) = C_1 \exp(-4x) + C_2 \exp(2x)$
- $y(x) = C_1 \exp(-2x) + C_2 \exp(4x)$ ✓
- $y(x) = C_1 \exp(-2x) + C_2 \exp(-8x)$
- $y(x) = C_1 \exp(-8x) + C_2 \exp(1x)$
- $y(x) = C_1 \sin(-4x) + C_2 \cos(2x)$
- $y(x) = C_1 \sin(-2x) + C_2 \cos(4x)$
- $y(x) = C_1 \sin(-2x) + C_2 \cos(8x)$
- $y(x) = C_1 \sin(-8x) + C_2 \cos(1x)$

Find a solution $y(x)$ such that $y(0) = 3$ and $\lim_{x\to\infty} y(x) = 0$. $C_1 =$ [a], $C_2 =$ [b].

[b]:

NUMERICAL 2 points

3 ✓	

[c]:

NUMERICAL 2 points

0 ✓	

For general values of C_1, C_2, choose a correct statement.

MULTI 2 points Single

- As $x \to \infty$, the solution converges to 0 for all C_1, C_2.
- As $x \to \infty$, the solution converges to 0 only for some C_1, C_2. ✓
- As $x \to \infty$, the solution never converges to 0.

(10) **Q5**

CLOZE | 0.10 penalty

If not specified otherwise, fill in the blanks with **integers (possibly 0 or negative)**. A fraction should be **reduced** (for example, $\frac{1}{2}$ is accepted but not $\frac{2}{4}$), and if it is negative and the answer boxes (such as $\frac{\boxed{a}}{\boxed{b}}$) have ambiguity, the negative sign should be put on the numerator (for example $\frac{-1}{2}$ is accepted but $\frac{1}{-2}$ is not). $\log x = \log_e x$, not $\log_{10} x$.

Choose the general solution of the following differential equation.

$$y'(x) = -y(x)^2 \cos(x^2)x.$$

MULTI | 2 points | Single

- $y(x) = \sin(x^2)/2 + C$
- $y(x) = \cos(x^2)/2 + C$
- $y(x) = \sin(x^2 + C)/2$
- $y(x) = \cos(x^2 + C)/2$
- $y(x) = \log(\sin(x^2)/2) + C$
- $y(x) = \log(\cos(x^2)/2) + C$
- $y(x) = \log(\sin(x^2)/2 + C)$
- $y(x) = \log(\cos(x^2)/2 + C)$
- $y(x) = 1/(\sin(x^2)/2 + C)$ ✓
- $y(x) = 1/(\sin(x^2))/2 + C$

Determine $C = \boxed{a}$ with the initial condition $y(0) = \frac{1}{2}$

$\boxed{a}$:

NUMERICAL | 2 points

2 ✓	

Choose the general solution of the following differential equation.

$$y''(x) + 2y'(x) - 8y(x) = 0.$$

MULTI | 2 points | Single

- $y(x) = C_1 \exp(2x) + C_2 \exp(-4x)$ ✓
- $y(x) = C_1 \exp(-2x) + C_2 \exp(4x)$
- $y(x) = C_1 \exp(-2x) + C_2 \exp(-8x)$
- $y(x) = C_1 \exp(-8x) + C_2 \exp(1x)$
- $y(x) = C_1 \sin(-4x) + C_2 \cos(2x)$
- $y(x) = C_1 \sin(-2x) + C_2 \cos(4x)$
- $y(x) = C_1 \sin(-2x) + C_2 \cos(8x)$
- $y(x) = C_1 \sin(-8x) + C_2 \cos(1x)$

Find a solution $y(x)$ such that $y(0) = 3$ and $\lim_{x\to\infty} y(x) = 0$.
$C_1 = \boxed{\text{a}}, C_2 = \boxed{\text{b}}$.

$\boxed{\text{b}}$:

NUMERICAL 2 points

0 ✓	

$\boxed{\text{c}}$:

NUMERICAL 2 points

3 ✓	

For general values of C_1, C_2, choose a correct statement.

MULTI 2 points Single

- As $x \to \infty$, the solution converges to 0 for all C_1, C_2.
- As $x \to \infty$, the solution converges to 0 only for some C_1, C_2. ✓
- As $x \to \infty$, the solution never converges to 0.

Total of marks: 216