Call4.

(1) **Q1**

EMBEDDED ANSWERS | penalty 0.10

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).

Complete the formulae.

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

$\boxed{a}$:

NUMERICAL | marked out of 1

0 ✓	

$\boxed{b}$:

NUMERICAL | marked out of 1

-2 ✓	

$\boxed{c}$:

NUMERICAL | marked out of 1

0 ✓	

$\boxed{d}$:

NUMERICAL | marked out of 2

4 ✓	

$\boxed{e}$:

NUMERICAL | marked out of 1

3 ✓	

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

$\boxed{g}$:

NUMERICAL | marked out of 1

1 ✓	

$\boxed{h}$:

NUMERICAL | marked out of 1

2 ✓	

[i]:

NUMERICAL | marked out of 1

3 ✓	

[j]:

NUMERICAL | marked out of 1

2 ✓	

[k]:

NUMERICAL | marked out of 1

2 ✓	

[l]:

NUMERICAL | marked out of 1

3 ✓	

$$x \log(1 + 5x^2) = \boxed{\text{m}} + \boxed{\text{n}}x + \boxed{\text{o}}x^2 + \boxed{\text{p}}x^3 + o(x^3) \text{ as } x \to 0.$$

[m]:

NUMERICAL | marked out of 1

0 ✓	

[n]:

NUMERICAL | marked out of 1

0 ✓	

[o]:

NUMERICAL | marked out of 1

0 ✓	

[p]:

NUMERICAL | marked out of 3

5 ✓	

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

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

This limit converges for $\alpha = \boxed{\text{q}}, \beta = \frac{\boxed{\text{r}}}{\boxed{\text{s}}}$.

[q]:

NUMERICAL | marked out of 6

-1 ✓	

[r]:

NUMERICAL | marked out of 3

-3 ✓	

[s]:

NUMERICAL | marked out of 3

2 ✓	

In that case, the limit is $\frac{\boxed{t}}{\boxed{u}}$.

[y]:

NUMERICAL | marked out of 3

2 ✓	

[u]:

NUMERICAL | marked out of 3

5 ✓	

(2) **Q1**

EMBEDDED ANSWERS | penalty 0.10

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).

Complete the formulae.

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

[a]:

NUMERICAL | marked out of 1

0 ✓	

[b]:

NUMERICAL | marked out of 1

2 ✓	

[c]:

NUMERICAL | marked out of 1

0 ✓	

[d]:

NUMERICAL | marked out of 2

-4 ✓	

e:

NUMERICAL | marked out of 1

3 ✓	

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

g:

NUMERICAL | marked out of 1

1 ✓	

h:

NUMERICAL | marked out of 1

-2 ✓	

i:

NUMERICAL | marked out of 1

3 ✓	

j:

NUMERICAL | marked out of 1

2 ✓	

k:

NUMERICAL | marked out of 1

-2 ✓	

l:

NUMERICAL | marked out of 1

3 ✓	

$$x\log(1+3x^2) = \boxed{m} + \boxed{n}x + \boxed{o}x^2 + \boxed{p}x^3 + o(x^3) \text{ as } x \to 0.$$

m:

NUMERICAL | marked out of 1

0 ✓	

n:

NUMERICAL | marked out of 1

0 ✓	

o:

NUMERICAL | marked out of 1

0 ✓	

p:

NUMERICAL | marked out of 3

3 ✓	

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

$$\lim_{x\to 0} \frac{\sin(2x) + e^{-x}(1-x) + \alpha + \beta x^2}{x \log(1+3x^2)}.$$

This limit converges for $\alpha =$ q, $\beta = \frac{\text{r}}{\text{s}}$.

q:

NUMERICAL | marked out of 6

-1 ✓	

r:

NUMERICAL | marked out of 3

-3 ✓	

s:

NUMERICAL | marked out of 3

2 ✓	

In that case, the limit is $\frac{\text{t}}{\text{u}}$.

y:

NUMERICAL | marked out of 3

-2 ✓	

u:

NUMERICAL | marked out of 3

3 ✓	

(3) **Q2**

EMBEDDED ANSWERS | penalty 0.10

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 $\frac{\text{a}}{\text{b}}$) have ambiguity, the negative sign should be put on the numerator (for example $\frac{-1}{2}$ is accepted but $\frac{1}{-2}$ is not).

Let us study the following series $\sum_{n=0}^{\infty} \frac{9^n-1}{n^2+1}(x+1)^{2n}$, with various x.

This series makes sense also for $x \in \mathbb{C}$. For $x = i$, calculate the partial sum $\sum_{n=0}^{2} \frac{9^n-1}{n^2+1}(x+1)^{2n} =$ a $+ i$ b.

a:

NUMERICAL | marked out of 2

-64 ✓	

b:

NUMERICAL | marked out of 2

8 ✓	

In order to discuss the convergence using the ratio test for $x \in \mathbb{R}$, we put $a_n = \frac{9^n-1}{n^2+1}(x+1)^{2n}$. Complete the formula.

$$\lim_{n\to\infty} \frac{a_{n+1}}{a_n} = \boxed{c}|x + \boxed{d}|^{\boxed{e}}$$

c:

NUMERICAL | marked out of 1

9 ✓	

d:

NUMERICAL | marked out of 2

1 ✓	

e:

NUMERICAL | marked out of 1

2 ✓	

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

MULTIPLE CHOICE | marked out of 8 | One answer only | Shuffle

- all x.
- $-3 < x < -1$.
- $-3 < x < 1$.
- $-\frac{4}{3} < x < -\frac{2}{3}$. ✓
- $-\frac{8}{9} < x < -\frac{1}{9}$.
- $\frac{1}{9} < x < \frac{8}{9}$.
- $\frac{2}{3} < x < \frac{4}{3}$.
- $-1 < x < 1$.
- $-1 < x < 3$.
- $x = 0$.
- $1 < x < 3$.

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

MULTIPLE CHOICE | marked out of 4 | One answer only | Shuffle

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

For the case $x = 1$, the series

Multiple choice | marked out of 4 | One answer only | Shuffle

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

(4) **Q2**

Embedded answers | penalty 0.10

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).

Let us study the following series $\sum_{n=0}^{\infty} \frac{9^n-1}{n^2+1}(x-1)^{2n}$, with various x.

This series makes sense also for $x \in \mathbb{C}$. For $x = i$, calculate the partial sum $\sum_{n=0}^{2} \frac{9^n-1}{n^2+1}(x-1)^{2n} = \boxed{\text{a}} + i\boxed{\text{b}}$.

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

Numerical | marked out of 2

-64 (0%)	

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

Numerical | marked out of 2

-8 (0%)	

In order to discuss the convergence using the ratio test for $x \in \mathbb{R}$, we put $a_n = \frac{9^n-1}{n^2+1}(x-1)^{2n}$. Complete the formula.

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

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

Numerical | marked out of 1

9 (0%)	

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

Numerical | marked out of 2

-1 (0%)	

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

Numerical | marked out of 1

2 (0%)	

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

MULTIPLE CHOICE | marked out of 8 | One answer only | Shuffle

- all x.
- $-3 < x < -1$.
- $-3 < x < 1$.
- $-\frac{4}{3} < x < -\frac{2}{3}$.
- $-\frac{8}{9} < x < -\frac{1}{9}$.
- $\frac{1}{9} < x < \frac{8}{9}$.
- $\frac{2}{3} < x < \frac{4}{3}$. ✓
- $-1 < x < 1$.
- $-1 < x < 3$.
- $x = 0$.
- $1 < x < 3$.

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

MULTIPLE CHOICE | marked out of 4 | One answer only | Shuffle

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

For the case $x = 1$, the series

MULTIPLE CHOICE | marked out of 4 | One answer only | Shuffle

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

(5) **Q3**

EMBEDDED ANSWERS | penalty 0.10

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

$$f(x) = \frac{xe^x}{1-x}.$$

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 $f(x)$.

MULTIPLE CHOICE | marked out of 4 | Multiple answers allowed | Shuffle

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

Choose all asymptotes of $f(x)$.

MULTIPLE CHOICE | marked out of 4 | Multiple answers allowed | Shuffle

- $y = -\pi$ (-100%)
- $y = -\frac{\pi}{2}$ (-100%)
- $y = -\frac{\pi}{4}$ (-100%)
- $y = 0$ (50%)
- $y = \frac{\pi}{4}$ (-100%)
- $y = \frac{\pi}{2}$ (-100%)
- $y = e$ (-100%)
- $x = -1$ (-100%)
- $x = -\frac{1}{e}$ (-100%)
- $x = 0$ (-100%)
- $x = 1$ (50%)
- $x = \frac{1}{e}$ (-100%)
- $y = x$ (-100%)
- $y = -x$ (-100%)
- $y = ex$ (-100%)

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

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

NUMERICAL | marked out of 4

2 (-100%)	

Among the stationary point(s), there is a local maximum at

$$x = \frac{\boxed{\text{b}}}{\boxed{\text{c}}} + \frac{\sqrt{\boxed{\text{d}}}}{\boxed{\text{e}}}.$$

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

NUMERICAL | marked out of 2

1 (-100%)	

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

NUMERICAL | marked out of 2

2 (-100%)	

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

NUMERICAL | marked out of 2

5 (−100%)	

[e]:

NUMERICAL | marked out of 2

2 (−100%)	

Choose the behaviour of $f(x)$ in the interval $(1, 2)$..

MULTIPLE CHOICE | marked out of 4 | One answer only | Shuffle

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

(6) **Q3**

EMBEDDED ANSWERS | penalty 0.10

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

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

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 $f(x)$.

MULTIPLE CHOICE | marked out of 4 | Multiple answers allowed | Shuffle

- $-e$ (−100%)
- -1 (100%)
- $-\frac{1}{e}$ (−100%)
- 0 (−100%)
- $\frac{1}{e}$ (−100%)
- 1 (−100%)
- e (−100%)

Choose all asymptotes of $f(x)$.

MULTIPLE CHOICE | marked out of 4 | Multiple answers allowed | Shuffle

- $y = -\pi$ (−100%)
- $y = -\frac{\pi}{2}$ (−100%)
- $y = -\frac{\pi}{4}$ (−100%)
- $y = 0$ (50%)
- $y = \frac{\pi}{4}$ (−100%)
- $y = \frac{\pi}{2}$ (−100%)

- $y = e$ (-100%)
- $x = -1$ (50%)
- $x = -\frac{1}{e}$ (-100%)
- $x = 0$ (-100%)
- $x = 1$ (-100%)
- $x = \frac{1}{e}$ (-100%)
- $y = x$ (-100%)
- $y = -x$ (-100%)
- $y = ex$ (-100%)

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

[a]:

NUMERICAL | marked out of 4

2 (-100%)	

Among the stationary point(s), there is a local maximum at

$$x = \frac{[b]}{[c]} + \frac{\sqrt{[d]}}{[e]}.$$

[b]:

NUMERICAL | marked out of 2

-1 (-100%)	

[c]:

NUMERICAL | marked out of 2

2 (-100%)	

[d]:

NUMERICAL | marked out of 2

5 (-100%)	

[e]:

NUMERICAL | marked out of 2

2 (-100%)	

Choose the behaviour of $f(x)$ in the interval $(1, 2)$..

MULTIPLE CHOICE | marked out of 4 | One answer only | Shuffle

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

(7) **Q4**

EMBEDDED ANSWERS | penalty 0.10

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).

Let us calculate the following integral.

$$\int_0^{\frac{\pi}{2}} \sin^2(x)\cos\left(x+\frac{\pi}{6}\right)dx.$$

Complete the formula

$$\cos\left(x+\frac{\pi}{6}\right) = \frac{\sqrt{\boxed{a}}}{\boxed{b}}\cos x + \frac{\boxed{c}}{\boxed{d}}\sin x.$$

a:

NUMERICAL | marked out of 2

3 (0%)	

b:

NUMERICAL | marked out of 2

2 (0%)	

c:

NUMERICAL | marked out of 2

-1 (0%)	

d:

NUMERICAL | marked out of 2

2 (0%)	

Choose a primitive of $\sin^2(x)\cos(x)$.

MULTIPLE CHOICE | marked out of 8 | One answer only | Shuffle

- $\frac{1}{3}\cos^3(x)\sin(x)$
- $-\frac{1}{3}\cos^3(x)\sin(x)$
- $\frac{1}{3}\sin^3(x)$ ✓
- $-\frac{1}{3}\sin^3(x)$
- $\frac{1}{2}\cos^3(\sin(x))$
- $-\frac{1}{2}\cos^3(\sin(x))$
- $\frac{1}{2}\sin^3(\cos(x))$
- $-\frac{1}{2}\sin^3(\cos(x))$

Choose a primitive of $\sin^3(x)$.

MULTIPLE CHOICE | marked out of 8 | One answer only | Shuffle

- $-\frac{1}{4}\cos^4(x)$
- $\frac{1}{4}\sin^4(x)$

- $-\cos(x)+\frac{1}{3}\cos^3(x)$ ✓
- $\cos(x)-\frac{1}{3}\cos^3(x)$
- $-\cos(x)+\frac{1}{3}\cos^3(x)$
- $\sin(x)-\frac{1}{3}\sin^3(x)$
- $x-\frac{1}{3}\sin^3(x)$
- $x-\frac{1}{3}\cos^3(x)$
- $x+\frac{1}{4}\sin^4(x)$
- $x-\frac{1}{4}\cos^4(x)$

By continuing, we get

$$\int_0^{\frac{\pi}{2}} \sin^2(x)\cos\left(x+\frac{\pi}{6}\right)dx = \frac{\boxed{\text{e}}}{\boxed{\text{f}}}+\frac{\sqrt{\boxed{\text{g}}}}{\boxed{\text{h}}}$$

.

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

NUMERICAL | marked out of 6

-1 (0%)	

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

NUMERICAL | marked out of 6

3 (0%)	

$\boxed{\text{g}}$:

NUMERICAL | marked out of 6

3 (0%)	

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

NUMERICAL | marked out of 6

6 (0%)	

(8) **Q4**

EMBEDDED ANSWERS | penalty 0.10

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).

Let us calculate the following integral.

$$\int_0^{\frac{\pi}{2}} \sin^2(x)\cos\left(x+\frac{7\pi}{6}\right)dx.$$

Complete the formula

$$\cos\left(x + \frac{7}{6}\pi\right) = -\frac{\sqrt{\boxed{\text{a}}}}{\boxed{\text{b}}}\cos x + \frac{\boxed{\text{c}}}{\boxed{\text{d}}}\sin x.$$

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

NUMERICAL | marked out of 2

3 (0%)	

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

NUMERICAL | marked out of 2

2 (0%)	

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

NUMERICAL | marked out of 2

1 (0%)	

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

NUMERICAL | marked out of 2

2 (0%)	

Choose a primitive of $\sin^2(x)\cos(x)$.

MULTIPLE CHOICE | marked out of 8 | One answer only | Shuffle

- $\frac{1}{3}\cos^3(x)\sin(x)$
- $-\frac{1}{3}\cos^3(x)\sin(x)$
- $\frac{1}{3}\sin^3(x)$ ✓
- $-\frac{1}{3}\sin^3(x)$
- $\frac{1}{2}\cos^3(\sin(x))$
- $-\frac{1}{2}\cos^3(\sin(x))$
- $\frac{1}{2}\sin^3(\cos(x))$
- $-\frac{1}{2}\sin^3(\cos(x))$

Choose a primitive of $\sin^3(x)$.

MULTIPLE CHOICE | marked out of 8 | One answer only | Shuffle

- $-\frac{1}{4}\cos^4(x)$
- $\frac{1}{4}\sin^4(x)$
- $-\cos(x) + \frac{1}{3}\cos^3(x)$ ✓
- $\cos(x) - \frac{1}{3}\cos^3(x)$
- $-\cos(x) + \frac{1}{3}\cos^3(x)$
- $\sin(x) - \frac{1}{3}\sin^3(x)$
- $x - \frac{1}{3}\sin^3(x)$
- $x - \frac{1}{3}\cos^3(x)$
- $x + \frac{1}{4}\sin^4(x)$
- $x - \frac{1}{4}\cos^4(x)$

By continuing, we get

$$\int_0^{\frac{\pi}{2}} \sin^2(x)\cos\left(x+\frac{7\pi}{6}\right)dx = \frac{\boxed{e}}{\boxed{f}} - \frac{\sqrt{\boxed{g}}}{\boxed{h}}$$

.

$\boxed{e}$:

NUMERICAL | marked out of 6

1 (0%)	

$\boxed{f}$:

NUMERICAL | marked out of 6

3 (0%)	

$\boxed{g}$:

NUMERICAL | marked out of 6

3 (0%)	

$\boxed{h}$:

NUMERICAL | marked out of 6

6 (0%)	

(9) **Q5**

EMBEDDED ANSWERS | penalty 0.10

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).

Let us consider the improper integral $\int_0^\infty f(x)dx$. Choose all function(s) $f(x)$ for which this improper integral converges.

MULTIPLE CHOICE | marked out of 6 | Multiple answers allowed | Shuffle

- $f(x) = \exp(x)$ (−100%)
- $f(x) = \exp(-x)$ (25%)
- $f(x) = x^2\exp(x)$ (−100%)
- $f(x) = x^2\exp(-x)$ (25%)
- $f(x) = \frac{1}{x}\exp(x)$ (−100%)
- $f(x) = \frac{1}{x}\exp(-x)$ (0%)
- $f(x) = \exp(x^2)$ (−100%)
- $f(x) = \exp(-x^2)$ (25%)
- $f(x) = x^2\exp(x^2)$ (−100%)
- $f(x) = x^2\exp(-x^2)$ (25%)

- $f(x) = \frac{1}{x}\exp(x^2)$ (−100%)
- $f(x) = \frac{1}{x}\exp(-x^2)$ (−100%)

Determine whether the following improper integral converges, and if so, calculate the value. If it does not converge, write $\frac{1}{0}$.

$$\int_0^\infty x^{-\frac{7}{4}} e^{-x^{-\frac{3}{4}}} dx = \frac{\boxed{a}}{\boxed{b}}.$$

a:

NUMERICAL marked out of 3

4 (−100%)	

b:

NUMERICAL marked out of 3

3 (−100%)	

Among the following improper integrals, choose the largest (and convergent) one and give its value c.

- $\int_0^\infty x\exp(-x/6)dx$
- $\int_0^\infty \exp(-x/6)$
- $\int_0^\infty x\exp(-x)dx$
- $\int_0^\infty \exp(-x)$
- $\int_0^\infty \frac{1}{x}\exp(-x)$
- $\int_0^\infty x\exp(-3x)dx$
- $\int_0^\infty \exp(-3x)dx$
- $\int_2^\infty \exp(-3x)dx$
- $\int_2^\infty \frac{1}{x}\exp(-3x)$
- $\int_2^\infty x\exp(-3x)dx$
- $\int_2^\infty x^2\exp(-3x)dx$

c:

NUMERICAL marked out of 6

36 (−100%)	

(10) **Q5**

EMBEDDED ANSWERS penalty 0.10

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).

Let us consider the improper integral $\int_{-\infty}^{0} f(x)dx$. Choose all function(s) $f(x)$ for which this improper integral converges.

Multiple choice | marked out of 6 | Multiple answers allowed | Shuffle

- $f(x) = \exp(x)$ (25%)
- $f(x) = \exp(-x)$ (−100%)
- $f(x) = x^2 \exp(x)$ (25%)
- $f(x) = x^2 \exp(-x)$ (−100%)
- $f(x) = \frac{1}{x} \exp(x)$ (−100%)
- $f(x) = \frac{1}{x} \exp(-x)$ (−100%)
- $f(x) = \exp(x^2)$ (−100%)
- $f(x) = \exp(-x^2)$ (25%)
- $f(x) = x^2 \exp(x^2)$ (−100%)
- $f(x) = x^2 \exp(-x^2)$ (25%)
- $f(x) = \frac{1}{x} \exp(x^2)$ (−100%)
- $f(x) = \frac{1}{x} \exp(-x^2)$ (−100%)

Determine whether the following improper integral converges, and if so, calculate the value. If it does not converge, write $\frac{1}{0}$.

$$\int_{0}^{\infty} x^{-\frac{7}{5}} e^{-x^{-\frac{2}{5}}} dx = \frac{\boxed{\text{a}}}{\boxed{\text{b}}}.$$

a:

Numerical | marked out of 3

5 (−100%)	

b:

Numerical | marked out of 3

2 (−100%)	

Among the following improper integrals, choose the largest (and convergent) one and give its value c.

- $\int_{0}^{\infty} x \exp(-x/5)dx$
- $\int_{0}^{\infty} \exp(-x/5)$
- $\int_{0}^{\infty} x \exp(-x)dx$
- $\int_{0}^{\infty} \exp(-x)$
- $\int_{0}^{\infty} \frac{1}{x} \exp(-x)$
- $\int_{0}^{\infty} x \exp(-3x)dx$
- $\int_{0}^{\infty} \exp(-3x)dx$
- $\int_{2}^{\infty} \exp(-3x)dx$
- $\int_{2}^{\infty} \frac{1}{x} \exp(-3x)$
- $\int_{2}^{\infty} x \exp(-3x)dx$
- $\int_{2}^{\infty} x^2 \exp(-3x)dx$

c :

NUMERICAL marked out of 6

25 (−100%)	

Total of marks: 300