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SPECIALIST MATHS
TRIAL EXAM 1
2000
SOLUTIONS

Part I - Multiple choice answers

1. E
2. E
3. B
4. D
5. C
6. D
7. A
8. E
9. E
10. D
11. B
12. C
13. D
14. C
15. E
16. B
17. D
18. A
19. D
20. C
21. D
22. A
23. E
24. A
25. B
26. D
27. D
28. E
29. E
30. D

Part I - Multiple choice solutions

Question 1

We have $y = \dfrac{1}{ax^2 + x}$

$$= \frac{1}{x(ax+1)}$$

We have vertical asymptotes given by $x = 0$ and $ax + 1 = 0$, that is, $x = -\dfrac{1}{a}$

We have a horizontal asymptote given by $y = 0$

The answer is E.

Question 2

$$\begin{aligned} \cot x &= -\frac{1}{2} \\ \text{so } \frac{1}{\tan x} &= -\frac{1}{2} \\ \tan x &= -2 \end{aligned}$$

$$\begin{aligned} &\text{Now, } 1 + \tan^2 x = \sec^2 x \\ &\text{so, } \quad 1 + 4 = \sec^2 x \\ &\qquad \sec^2 x = 5 \\ &\qquad \sec x = \sqrt{5} \qquad \text{(fourth quadrant so sec is + ve)} \\ &\text{so, } \quad \frac{1}{\cos x} = \sqrt{5} \\ &\qquad \cos x = \frac{1}{\sqrt{5}} \end{aligned}$$

The answer is E.

Question 3

$$
\begin{aligned}
y &= \mathrm{Tan}^{-1}(2x) + \cot(2x) \\
&= \mathrm{Tan}^{-1}\left(\frac{x}{1/2}\right) + (\tan(2x))^{-1}
\end{aligned}
$$

$$
\begin{aligned}
\text{So, } \frac{dy}{dx} &= \frac{1/2}{1/4 + x^2} - 1 \times (\tan(2x))^{-2} \times 2\sec^2(2x) \\
&= \frac{1}{2} \div \frac{1+4x^2}{4} - \frac{2\sec^2(2x)}{\tan^2(2x)} \\
&= \frac{1}{2} \times \frac{4}{1+4x^2} - \frac{2\sec^2(2x)}{\tan^2(2x)} \\
&= \frac{2}{1+4x^2} - \frac{2\sec^2(2x)}{\tan^2(2x)}
\end{aligned}
$$

The answer is B.

Question 4

$$
\begin{aligned}
y &= \sec(2x) \\
&= \frac{1}{\cos(2x)} \\
&= (\cos(2x))^{-1}
\end{aligned}
$$

$$
\begin{aligned}
\frac{dy}{dx} &= -1(\cos(2x))^{-2} \times -2\sin(2x) \\
&= \frac{2\sin(2x)}{\cos^2(2x)}
\end{aligned}
$$

$$
\begin{aligned}
\frac{d^2y}{dx^2} &= \frac{\cos^2(2x) \times 4\cos(2x) - 2\sin(2x) \times 2\cos(2x) \times -2\sin(2x)}{\cos^4(2x)} \\
&= \frac{4\cos^3(2x) + 8\sin^2(2x)\cos(2x)}{\cos^4(2x)} \\
&= 4\sec(2x) + 8\sec(2x)\tan^2(2x)
\end{aligned}
$$

The answer is D.

Question 5

We are looking for 3 points which are equidistant from the origin and spaced $\frac{2\pi}{3}$ apart. The 3 which satisfy these requirements are E, I and M.

The answer is C.

Question 6

Using De Moivre's theorem, we have $z^5 = 2^5 \mathrm{cis}(\frac{2\pi}{3} \times 5)$

$$= 32\mathrm{cis}(\frac{10\pi}{3})$$

The answer is D.

Question 7

Since the coefficients of the terms in $P(z)$ are not all real, the conjugate root theorem does not apply. If $z-5i$ is a factor, then $5i$ is a solution and $P(5i)=0$. So options B and C are correct.

$$\begin{aligned}P(z)&=z^3-5iz^2-4z+20i\\&=(z-5i)(z^2-4)\\&=(z-5i)(z-2)(z+2)\end{aligned}$$

So the roots of the equation are $5i$ and ± 2. So, options D and E are correct and clearly option A is not correct. The answer is A.

Question 8

Now, $(\underset{\sim}{i}-2\underset{\sim}{j}+5\underset{\sim}{k}).(3\underset{\sim}{i}+4\underset{\sim}{j}-\underset{\sim}{k})$

$$\begin{aligned}&=3-8-5\\&=-10\end{aligned}$$

Now, $\cos\theta=\dfrac{\underset{\sim}{a}.\underset{\sim}{b}}{|\underset{\sim}{a}||\underset{\sim}{b}|}$ where θ is the angle between vectors $\underset{\sim}{a}$ and $\underset{\sim}{b}$

$$=\frac{-10}{\sqrt{30}\times\sqrt{26}}$$

$$\theta=110°59'$$

The answer is E.

Question 9

If two vectors $\underset{\sim}{u}$ and $\underset{\sim}{v}$ are linearly dependent then $k_1\underset{\sim}{u}+k_2\underset{\sim}{v}=0,\quad k_1$ and $k_2\neq 0$

That is, $k_1\underset{\sim}{u}=-k_2\underset{\sim}{v},\quad k_1$ and $k_2\neq 0$

So we require that $\underset{\sim}{u}$ and $\underset{\sim}{v}$ are parallel vectors. Only $\underset{\sim 2}{v}$ and $\underset{\sim 4}{v}$ offer this since $-2\underset{\sim 2}{v}=\underset{\sim 4}{v}$

The answer is E.

Question 10

The vector resolute of $\underset{\sim}{v}$ perpendicular to $\underset{\sim}{u}$ is given by

$$\begin{aligned}&\underset{\sim}{v}-(\underset{\sim}{v}.\underset{\sim}{\hat{u}})\underset{\sim}{\hat{u}}\\&=\underset{\sim}{i}-2\underset{\sim}{j}+4\underset{\sim}{k}-\left\{(\underset{\sim}{i}-2\underset{\sim}{j}+4\underset{\sim}{k}).\frac{1}{\sqrt{9+1+4}}(3\underset{\sim}{i}+\underset{\sim}{j}-2\underset{\sim}{k})\right\}\times\frac{1}{\sqrt{14}}(3\underset{\sim}{i}+\underset{\sim}{j}-2\underset{\sim}{k})\\&=\underset{\sim}{i}-2\underset{\sim}{j}+4\underset{\sim}{k}-\frac{1}{\sqrt{14}}(3-2-8)\times\frac{1}{\sqrt{14}}(3\underset{\sim}{i}+\underset{\sim}{j}-2\underset{\sim}{k})\\&=\underset{\sim}{i}-2\underset{\sim}{j}+4\underset{\sim}{k}-\frac{-7}{14}(3\underset{\sim}{i}+\underset{\sim}{j}-2\underset{\sim}{k})\\&=\underset{\sim}{i}-2\underset{\sim}{j}+4\underset{\sim}{k}+\frac{3}{2}\underset{\sim}{i}+\frac{1}{2}\underset{\sim}{j}-\underset{\sim}{k}\\&=\frac{1}{2}(5\underset{\sim}{i}-3\underset{\sim}{j}+6\underset{\sim}{k})\end{aligned}$$

The answer is D.

Question 11

Now, $x = \frac{t-4}{3}$ and $y = \sqrt{t}$

so, $t = 3x + 4$ so $y = \sqrt{3x+4}$

Since $t \geq 0$, $3x + 4 \geq 0$ and $y \geq 0$

$$x \geq \frac{-4}{3}$$

The answer is B.

Question 12

Since $f'(1)$ is not defined then $f(x)$ is discontinuous at $x = 1$ or has a "sharp corner" at $x = 1$. So $f(x)$ has at most one point of discontinuity. So options A and B are not correct. The gradient of the graph of $f'(x)$, is zero at one point only, that is at $x = 0$. We note that the gradient of the function $f'(x)$ just to the left of the point where $x = 0$ is positive and just to the right, it is negative. So there is one point of inflection only. Also, a stationary point occurs when $f'(x)=0$. This occurs only once when $x = -1$.
Note that at $x = 1$, $f'(x)$ is undefined. The answer is C.

Question 13

$f''(2) = 0$ means that we could have a point of inflection or a stationary point of any kind. If there is a point of discontinuity at $x = 2$ on the graph of $y = f(x)$ then $y = f'(2)$ and hence $y = f''(2)$ will not exist.
The answer is D.

Question 14

$$\int 5x\sqrt{1-2x^2}\,dx \qquad \text{let } u = 1 - 2x^2$$

$$= \int u^{\frac{1}{2}} \times \frac{-5}{4} . \frac{du}{dx} dx \qquad \frac{du}{dx} = -4x$$

$$= \frac{-5}{4}\int u^{\frac{1}{2}} du$$

$$= \frac{-5}{4} \times u^{\frac{3}{2}} . \frac{2}{3}$$

$$= \frac{-10}{12}(1-2x^2)^{\frac{3}{2}}$$

$$= \frac{-5(1-2x^2)^{\frac{3}{2}}}{6}$$

The answer is C.

Question 15

$$\int 2x\sqrt{1-\frac{x}{2}}\,dx \qquad \text{let } u = 1-\frac{x}{2}$$

$$= \int (4-4u)u^{\frac{1}{2}}.-2\times\frac{du}{dx}\,dx \qquad \frac{du}{dx} = -\frac{1}{2} \quad \text{Also, } \frac{x}{2} = 1-u, \text{ so, } x = 2-2u$$

$$= -8\int (1-u)u^{\frac{1}{2}}\,du$$

$$= -8\int (u^{\frac{1}{2}} - u^{\frac{3}{2}})\,du$$

$$= -8\left(\frac{2u^{\frac{3}{2}}}{3} - \frac{2u^{\frac{5}{2}}}{5}\right) + c$$

$$= \frac{-16}{3}\left(1-\frac{x}{2}\right)^{\frac{3}{2}} + \frac{16}{5}\left(1-\frac{x}{2}\right)^{\frac{5}{2}} + c$$

The answer is E.

Question 16

$$\int_0^2 \frac{3}{\sqrt{4-x^2}}\,dx$$

$$= 3\int_0^2 \frac{1}{\sqrt{4-x^2}}\,dx$$

$$= 3\left[\text{Sin}^{-1}\frac{x}{2}\right]_0^2$$

$$= 3(\text{Sin}^{-1}1 - \text{Sin}^{-1}0)$$

$$= 3\left(\frac{\pi}{2} - 0\right)$$

$$= \frac{3\pi}{2}$$

The answer is B.

Question 17

$$\text{Area required} = 1\times f(3.5) + 1\times f(4.5)$$
$$= 6.0 \text{ correct to 1 decimal place}$$

The answer is D.

Question 18

$$\text{area required} = \int_0^{3\pi} \sin^2(\frac{x}{3})dx$$

$$= \frac{1}{2}\int_0^{3\pi} (1\text{-}\cos(\frac{2x}{3}))dx$$

$$= \frac{1}{2}\left[x - \frac{3}{2}\sin(\frac{2x}{3})\right]_0^{3\pi}$$

The answer is A.

Question 19

$$\text{volume required} = \pi\int_{0.5}^{5} y^2 dx$$

$$= \pi\int_{0.5}^{5} (\log_e(2x))^2 dx$$

The answer is D.

Question 20

Now, $y = \log_e(2t)$ and $x = t^2(t+1)$

So, $\frac{dy}{dt} = \frac{1}{t}$ $\frac{dx}{dt} = 3t^2 + 2t$

Also,
$$\frac{dy}{dx} = \frac{dy}{dt}.\frac{dt}{dx}$$
$$= \frac{1}{t}.\frac{1}{3t^2 + 2t}$$
$$= \frac{1}{t^2(3t+2)}$$

The answer is C.

Question 21

$$\frac{dy}{dx}=\frac{e^{2x}}{2-e^{2x}}dx \qquad u=2-e^{2x}$$

So, $$y=\int -\frac{1}{2}\frac{du}{dx}u^{-1}dx \qquad \frac{du}{dx}=-2e^{2x}$$

$$=-\frac{1}{2}\int u^{-1}du$$

$$=-\frac{1}{2}\log_e u+c$$

$$=-\frac{1}{2}\log_e(2-e^{2x})+c$$

When $x=0, y=0$,

$$0=-\frac{1}{2}\log_e(2-e^{0})+c$$

$$0=-\frac{1}{2}\log_e 1+c$$

$$c=0$$

So, $y=-\frac{1}{2}\log_e(2-e^{2x})$

The answer is D.

Question 22

The gradient of the tangent at (x,y) is $\frac{dy}{dx}$

The gradient of the normal at (x,y) is $-\frac{dx}{dy}$

So, $-\frac{dx}{dy}=2x$ and therefore $\frac{dy}{dx}=-\frac{1}{2x}$

The answer is A.

Question 23

$$x = \text{Sin}^{-1}(\frac{1}{t^2-3t}) \quad t \geq 0$$

$$= \text{Sin}^{-1}u$$

$$\frac{dx}{du} = \frac{1}{\sqrt{1-u^2}}$$

$$= \frac{1}{\sqrt{1-\frac{1}{(t^2-3t)^2}}}$$

$$\text{let } u = \frac{1}{t^2-3t}$$

$$= (t^2-3t)^{-1}$$

$$\frac{du}{dt} = -1(t^2-3t)^{-2} \times (2t-3)$$

$$= \frac{3-2t}{(t^2-3t)^2}$$

Now, $\frac{dx}{dt} = \frac{dx}{du}.\frac{du}{dt}$

$$= \frac{1}{\sqrt{1-\frac{1}{(t^2-3t)^2}}} \times \frac{3-2t}{(t^2-3t)^2}$$

When particle is at rest, $\frac{dx}{dt} = 0$, that is, $3-2t=0$, since if the denominator is equal to zero then $\frac{dx}{dt}$ is undefined. So, $t = \frac{3}{2}$. The answer is E.

Question 24

$$a = 3x^4 - x^2$$

So, $\frac{d}{dx}(\frac{1}{2}v^2) = 3x^4 - x^2$

So, $(\frac{1}{2}v^2) = \int(3x^4 - x^2)dx$

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

when $x = 0$, $v = 0$ so

$$0 = 0 - 0 + c$$

So, $c = 0$

So, $\frac{1}{2}v^2 = \frac{3x^5}{5} - \frac{x^3}{3}$

$$v = \pm\sqrt{\frac{6x^5}{5} - \frac{2x^3}{3}}$$

When $x = 1$, $v = \pm\sqrt{\frac{6}{5} - \frac{2}{3}}$

$$= \pm\sqrt{\frac{8}{15}}$$

So the velocity could be $\sqrt{\frac{8}{15}}$ or $-\sqrt{\frac{8}{15}}$

The answer is A.

Question 25

$$d_f = [-5, 5] \qquad r_f = [0, \pi]$$

So, $d_{f^{-1}} = [0, \pi] \qquad r_{f^{-1}} = [-5, 5]$

Let $y = \text{Cos}^{-1}(\frac{x}{5})$

Swap x and y

$$x = \text{Cos}^{-1}(\frac{y}{5})$$

Rearranging,

$$\frac{y}{5} = \text{Cos}\,x$$

$$y = 5\text{Cos}\,x$$

So, $f^{-1}(x) = 5\text{Cos}\,x$

The inverse function is $f^{-1} : [0, \pi] \rightarrow R$ where $f^{-1}(x) = 5\text{Cos}\,x$

The answer is B.

Question 26

We need to make allowance for that part of the area that falls below the x axis.
So, the required area is given by

$$\int_0^4 (-t^2 + 2t + 8)dt - \int_4^5 (-t^2 + 2t + 8)dt$$

The answer is D.

Question 27

The resultant force acting on the body is given by $\underset{\sim}{R}$

Now, $\underset{\sim}{R} = m\underset{\sim}{a}$

So, $3\underset{\sim}{i} - 7\underset{\sim}{j} - \underset{\sim}{i} + 5\underset{\sim}{j} = 2 \times \underset{\sim}{a}$

So, $\underset{\sim}{a} = \frac{1}{2}(2\underset{\sim}{i} - 2\underset{\sim}{j})$

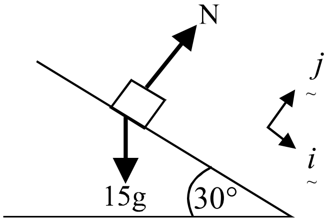
$$= \underset{\sim}{i} - \underset{\sim}{j}$$

The answer is D.

Question 28

$$(15g\sin 30°)\underset{\sim}{i} + (N - 15g\cos 30°)\underset{\sim}{j} = m\underset{\sim}{a}$$

$$= 15a\underset{\sim}{i}$$



So, $N - \frac{15\sqrt{3}g}{2} = 0$

$$N = \frac{15\sqrt{3}g}{2}$$

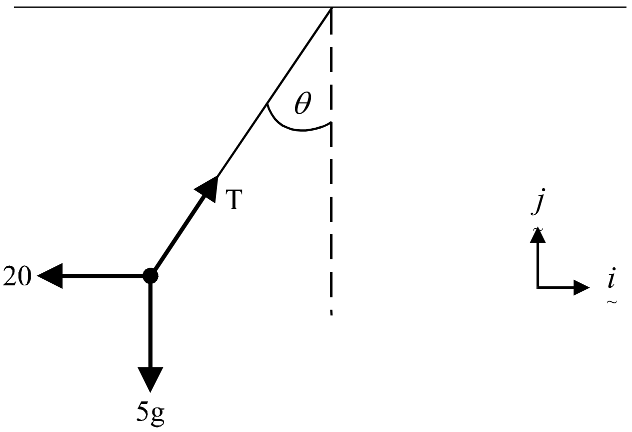
The answer is E.

Question 29

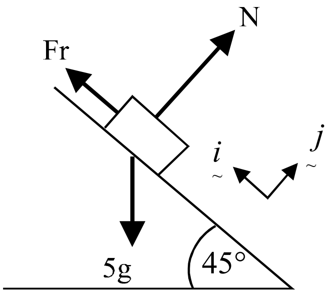
From the diagram, we have

$\underset{\sim}{R} = (T\sin\theta - 20)\underset{\sim}{i} + (T\cos\theta - 5g)\underset{\sim}{j}$

The answer is E.



Question 30



$(Fr - 5g\sin 45°)\underset{\sim}{i} + (N - 5g\cos 45°)\underset{\sim}{j} = \underset{\sim}{0}$ $\quad$ $(ie\ m\underset{\sim}{a} = \underset{\sim}{0})$

So, $Fr = \dfrac{5g}{\sqrt{2}}$

Now, at the point of slipping, $Fr = \mu N$,

$$= \sqrt{2} \times \frac{5g}{\sqrt{2}} \text{ since } N = \frac{5g}{\sqrt{2}}$$

$$= 5g$$

So, the difference between the frictional force of the mass currently and the frictional force of the mass when it was on the point of slipping down the plane is given by $5g - \dfrac{5g}{\sqrt{2}}$

The answer is D.

PART II - short answer solutions

Question 1

$f(x)$ and $g(x)$ intersect when

$$\sqrt{25-x^2}=\frac{25-x}{7}$$

$$25-x^2=\frac{(25-x)^2}{49}$$

$$1225-49x^2=625-50x+x^2$$

$$0=50x^2-50x-600$$

$$=x^2-x-12$$

$$=(x-4)(x+3)$$

$x=4$ or x = -3 (1 mark)

$$\text{Area required}=\int_{-3}^{4}\{f(x)-g(x)\}dx \quad \text{(1 mark)}$$

$$=\int_{-3}^{4}(\sqrt{25-x^2}-\frac{25-x}{7})dx \quad \text{(use a graphics calculator to evaluate this)}$$

$$=7.135 \text{ (to 3 places)}$$

Area = 7.135 square units (to 3 places) (1 mark)

Question 2

If ai is a solution then $a^4+6a^3i-14a^2-24ai+40=0+0i$

So, $a^4-14a^2+40=0$ and $6a^3-24a=0$

$(a^2-10)(a^2-4)=0 \qquad 6a(a^2-4)=0$

$a=\pm\sqrt{10},\ a=\pm2 \qquad a=0,\ a=\pm2$

Since we require solutions which satisfy both these equations, we have $a=\pm2$ (1 mark)

So, $-2i$ and 2i are solutions and hence $z+2i$ and $z-2i$ are factors.

So, $(z+2i)(z-2i)=z^2+4$ is a quadratic factor. (1 mark)

Now, $z^4-6x^3+14z^2-24z+40=(z^2+4)(z^2-6z+10)$ (1mark)

$$=(z^2+4)((z^2-6z+9)-9+10)$$

$$=(z^2+4)((z-3)^2+1)$$

$$=(z+2i)(z-2i)(z-3+i)(z-3-i)$$

So the solutions are $z=\pm2i,\ 3\pm i$ (1 mark)

Question 3

$$\int_0^{\frac{\pi}{4}} \sin(2x)\cos^2 x dx \qquad u = \cos x \quad \text{so, } \frac{du}{dx} = -\sin x$$

$$= \int_0^{\frac{\pi}{4}} 2\sin x \cos x \cos^2 x dx \qquad \text{Now, if } x = \frac{\pi}{4} \text{ then } u = \cos\frac{\pi}{4} = \frac{1}{\sqrt{2}}$$

$$= 2\int_0^{\frac{\pi}{4}} \sin x \cos^3 x dx \qquad \text{and if } x = 0\text{, then } u = \cos 0 = 1$$

$$= -2\int_1^{\frac{1}{\sqrt{2}}} \frac{du}{dx} u^3 dx \qquad \text{(1 mark) for terminals} \quad \text{(1 mark) for integrand}$$

$$= -2\int_1^{\frac{1}{\sqrt{2}}} u^3 du$$

$$= -2\left[\frac{u^4}{4}\right]_1^{\frac{1}{\sqrt{2}}}$$

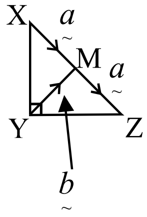
$$= -2(\frac{1}{4} \div 4 - \frac{1}{4})$$

$$= -2 \times -\frac{3}{16}$$

$$= \frac{3}{8} \qquad \text{(1 mark)}$$

Question 4

a. $\overset{\rightarrow}{XY} = \underset{\sim}{a} - \underset{\sim}{b} \qquad \overset{\rightarrow}{\text{YZ}} = \underset{\sim}{b} + \underset{\sim}{a} \qquad$ (1 mark)



b.

To Prove : $|\underset{\sim}{a}| = |\underset{\sim}{b}|$ (1 mark)

Now, $\overrightarrow{XY}.\overrightarrow{YZ} = 0$ since $\angle XYZ = 90°$

From part a. the above equation becomes

$$(\underset{\sim}{a} - \underset{\sim}{b}).(\underset{\sim}{b} + \underset{\sim}{a}) = 0$$ (1mark)

$$\underset{\sim}{a}.\underset{\sim}{b} + \underset{\sim}{a}.\underset{\sim}{a} - \underset{\sim}{b}.\underset{\sim}{b} - \underset{\sim}{a}.\underset{\sim}{b} = 0$$

So, $a^2 - b^2 = 0$ since $\underset{\sim}{a}.\underset{\sim}{a} = |\underset{\sim}{a}||\underset{\sim}{a}|\cos 0$

$= a^2$

Similarly $\underset{\sim}{b}.\underset{\sim}{b} = b^2$

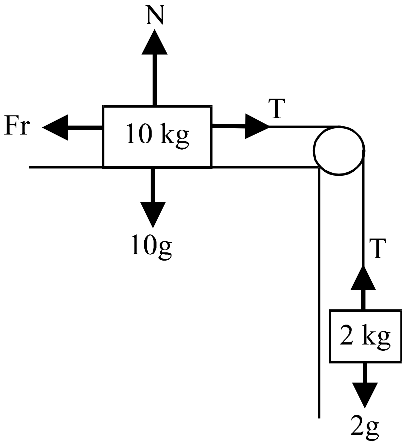
Therefore $a^2 = b^2$

Therefore $|\underset{\sim}{a}| = |\underset{\sim}{b}|$ Have Proved (1mark)

Hence $MX = MZ = MY$

Question 5

a.



(1 mark)

b. Around the 10 kg weight, we have

$Fr = T$ and $N = 10g$

Around the 2 kg weight, we have

$T = 2g$

(1 mark)

So, $Fr = 2g$

Now since the weights are on the point of moving, we have

$Fr = \mu N$

so, $2g = \mu N$

$\mu = \dfrac{2g}{10g}$ since $N = 10g$ from above

$\mu = \dfrac{1}{5}$

(1 mark)

Question 6

Now,
$$\begin{array}{r} 1 \\ x^2-x-2\,\big)\overline{x^2-x} \\ x^2-x-2 \\ \hline 2 \end{array}$$

OR
$$\frac{x^2-x}{x^2-x-2}=\frac{(x^2-x-2)+2}{x^2-x-2}$$
$$=1+\frac{2}{x^2-x-2}$$

So, $\displaystyle\int_3^a \frac{x^2-x}{x^2-x-2}dx=\int_3^a (1+\frac{2}{x^2-x-2})dx$

$$=\int_3^a (1+\frac{2}{(x-2)(x+1)})dx$$

let $\displaystyle\frac{2}{(x\text{-}2)(x+1)}\equiv\frac{A}{(x-2)}+\frac{B}{(x+1)}$

$$\equiv\frac{A(x+1)+B(x-2)}{(x-2)(x+1)}$$

True iff $\quad 2\equiv A(x+1)+B(x-2)$

Put $x=-1 \quad 2=-3B \quad B=\frac{-2}{3}$

Put $x=2 \quad 2=3A \quad A=\frac{2}{3}$

So, $\displaystyle\frac{2}{(x-2)(x+1)}=\frac{2}{3(x-2)}-\frac{2}{3(x+1)}$

$$=\int_3^a (1+\frac{2}{3(x-2)}-\frac{2}{3(x+1)})dx \qquad \text{(1 mark)}$$

$$=\left[x+\frac{2}{3}\log_e(x-2)-\frac{2}{3}\log_e(x+1)\right]_3^a$$

$$=\left[x+\frac{2}{3}\log_e\frac{x-2}{x+1}\right]_3^a$$

$$=\left\{(a+\frac{2}{3}\log_e\frac{a-2}{a+1})-(3+\frac{2}{3}\log_e\frac{1}{4})\right\}$$

$$=a-3+\frac{2}{3}\log_e\frac{4(a-2)}{a+1} \qquad \text{(1 mark)}$$

We are told that the definite integral is equal to $2+\frac{2}{3}\log_e 2$

Equating, we obtain, $a-3=2$, so, $a=5$

Checking, we obtain $\displaystyle\frac{4(a-2)}{a+1}=2$

$$4a-8=2a+2$$

$$a=5 \qquad \text{(1 mark)}$$

Total 20 marks