

Farmer Olympiad 2022 Round I

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You have 30 minutes to complete this exam. Circle the choice you believe is correct. No certain rabbits allowed! There is a total of 49 marks available. Good luck!

Candidate Name: _____

1. (3 marks) Which of the following is not a conic section?
A. Circle B. Parabola C. Quartic D. Ellipse E. Hyperbola
2. (4 marks) A certain rabbit starts walking in infinitesimal increments at forward initial velocity $2ms^{-1}$. Every second he walks his velocity halves, with constant direction. Exactly how many metres does he travel in total?
A. $1.38m$ B. $\frac{1}{\ln(2)}m$ C. $4m$ D. $\frac{2}{\ln(2)}m$ E. $\sqrt{2}m$
3. (4 marks) Let $f(x) = \frac{e^x - e^{-x}}{2}$. What would $\frac{d^3f}{dx^3}$ equal?
A. $\frac{e^x - e^{-x}}{e^x + e^{-x}}$ B. $\frac{e^x + e^{-x}}{2}$ C. $\frac{e^x + e^{-x}}{e^x - e^{-x}}$ D. $e^{x - \frac{1}{x}}$ E. $\frac{e^x - e^{-x}}{2}$
4. (4 marks) Which of the following is indeterminate?
A. $\sin^{-1}(\sin(\frac{5\pi}{4}))$ B. $\sin^{-1}(\sin^{-1}(\frac{\pi}{4}))$ C. $\sin^{-1}(\sin(\frac{-9\pi}{4}))$ D. $\sin^{-1}(\sin(e))$ E. $\sin(\sin^{-1}(e))$
5. (4 marks) A certain rabbit pulls peppers from a bag. The bag contains 7 chilli peppers and 8 sweet peppers. If the certain rabbit picks 6 random peppers from the bag without replacement, what is the probability that 4 of them are chilli to 3 significant figures?
A. 0.272 B. 0.196 C. 0.777 D. 0.152 E. 0.383
6. (4 marks) Which of the following is not a root of $1000x^3 - 8500x^2 + 2063x - 14651 = 0$?
A. 1.3 B. 2.3 C. 3.5 D. 4.9
7. (4 marks) In a ship with 10 crewmates, each crewmate has a 0.3 probability of being an impostor. There is a 0.1029 probability of the n th crewmate selected with replacement being the first found impostor. Find n .
A. 3 B. 4 C. 5 D. 6 E. 7 F. 8
8. (4 marks) A certain farmer throws 49 electron-ohms per nanocoulomb per hour per meganewton per femtovolt per gigawatt per zetaradian per terabyte. Give the SI units of this expression.
A. $A^{-2}kg^{-4}m^{-2}s^{-3}$ B. $eA^{-2}kg^{-4}m^{-2}s^{-3}B^{-1}$ C. $eA^{-2}kg^{-2}m^{-2}s^3B^{-1}$ D. $A^{-2}kg^{-2}m^{-2}s^3$
9. (4 marks) A bowman fires an arrow at $30\sqrt{2}ms^{-1}$ inclined by $\frac{\pi}{4}rad$ to the horizontal from ground level. How far away from the bowman would the arrow land?
A. $\frac{60}{g}m$ B. $\frac{120}{g}m$ C. $\frac{1200\sqrt{2}}{g}m$ D. $\frac{1800}{g}m$
10. (4 marks) Vector $u = (4, 9)$ is projected onto vector $v = (6, 8)$ to form vector w . Find \hat{w} .
A. $\frac{96}{100}(6, 8)$ B. $\frac{96}{100}(4, 9)$ C. $(0.6, 0.8)$ D. $(\frac{10}{\sqrt{97}}, \frac{17}{\sqrt{97}})$
11. (4 marks) The certain rabbit wants to know $gcd(9198, 2128)$. Help him!
A. 8 B. 14 C. 16 D. 24 E. 38
12. (6 marks) Evaluate $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} (\int_{-\frac{\pi}{4}}^{\frac{\pi}{4}} (\sec^2(x) - \cot(y)\csc(y))dx)dy$
A. π B. 2π C. 4π D. 8π E. 16π

Good luck!