**6**. [15 points] In the following questions, circle the correct answer. You do not need to show any work, but make sure your answer is clear. No points will be given for unclear answers.

**a**. [3 points] The value of $A$ for which the function $y = e^{x^2+A^3x}$ solves the equation $y' + 8y = 2xy$ is

$$0 \qquad -2 \qquad -8 \qquad -\sqrt{8} \qquad 1$$

**b**. [3 points] The function $g$ is positive, decreasing and differentiable. The solution curves of the differential equation $y' = e^{-x}g(y)$ are

concave up  concave down  changing concavity

**c**. [3 points] Suppose that $h(x)$ is an increasing differentiable function with $h(0) = 0$ and $\lim_{x\to\infty} h(x) = 5$. The value of the integral $\displaystyle\int_0^\infty (h(x))^4 h'(x)\,dx$

diverges  is $5^4$  is $5^4 - \dfrac{1}{5}$  is 1  is 0

**d**. [3 points] Suppose $a \geq 1$ is a constant, and the function $h$ satisfies $\dfrac{1}{x^{1/a}} \leq h(x) \leq \dfrac{1}{x^a}$ for $0 \leq x \leq 1$. The integral $\displaystyle\int_0^1 (h(x))^2 dx$ converges

always  never  sometimes

**e**. [3 points] The function $f$ satisfies $\dfrac{1}{x^3} \leq f(x) \leq \dfrac{1}{x}$ for $x \geq 1$ and $f(x) = g(x^2)$. The integral $\displaystyle\int_1^\infty \frac{g(x)}{x} dx$ converges

always  never  sometimes