

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  $y = e^{x^2 + A^3 x}$  solves the equation  $y' + 8y = 2xy$  is

- 0       -2      - 8      -  $\sqrt{8}$       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  $\lim_{x \rightarrow \infty} h(x) = 5$ . The value of the integral  $\int_0^{\infty} (h(x))^4 h'(x) dx$

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

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

- always      never       sometimes

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

- always      never      sometimes