

8. [9 points] The following parts are unrelated. No justification is required for your answers.

a. [3 points] Suppose  $f$  and  $g$  are twice differentiable functions satisfying  $f(0) = 0$ ,  $f(1) = 1$ ,  $g(0) = 1$ , and  $g(1) = 0$ . Which of the following **must** be true? Circle **all** correct answers.

i.  $\int_0^1 (f(x) - g(x)) \, dx = 0$

iv.  $\int_0^1 x f''(x) \, dx + 1 = f'(0) + \int_0^1 f''(x) \, dx$

ii.  $\int_0^1 (f'(x) + g'(x)) \, dx = 0$

v.  $\int_0^1 e^x g(x) \, dx = - \int_0^1 e^x g'(x) \, dx$

iii.  $\int_0^1 (f''(x) - g''(x)) \, dx = 0$

vi. NONE OF THESE

b. [3 points] Which of the following are antiderivatives to the function  $h(x) = \cos(x^2)$ ? Circle **all** correct answers.

i.  $\frac{\sin(x^2)}{2x}$

iv.  $\int_2^x \cos(t^2) \, dt$

ii.  $\int_0^1 \cos(x^2) \, dx$

v.  $\int_0^1 \cos(t^2) \, dt + \int_0^x \cos(t^2) \, dt$

iii.  $\int_0^{x^2} \cos(t) \, dt$

vi. NONE OF THESE

c. [3 points] For which of the following integrals could the sum

$$\sum_{n=0}^3 \frac{1}{2} \cos(n)$$

serve as a left Riemann sum approximation? Circle **all** correct answers.

i.  $\int_0^3 \frac{1}{2} \cos(x) \, dx$

iv.  $\int_0^2 \cos(2x) \, dx$

ii.  $\int_0^4 \frac{1}{2} \cos(x) \, dx$

v.  $\int_0^3 \cos(2x) \, dx$

iii.  $\int_{-1}^3 \frac{1}{2} \cos(x) \, dx$

vi. NONE OF THESE