

MATH 1325 Test 3

Name: _____

1. The function $f(x, y) = 8x^3 + 7xy + 7y^2 + 12$ has two critical points: $(0, 0)$ and $(49/336, -343/4704)$.
 - (a) Find formulas for the second partial derivatives f_{xx} , f_{xy} , and f_{yy} .
 - (b) Classify each critical point as a saddle point, location of a local maximum, or location of a local minimum.

2. Given demand $p = D(x) = 31 - (x/100)$ and supply $p = S(x) = 5 + (x/170)$, find the consumer surplus.

3. Suppose that:

- Initially, at time $t = 0$ years, you have $B = 25$ thousand dollars worth of bonds.
- All your bonds earns interest at a rate of $r = 8\% = 0.08$ per year.
- Whenever you receive an interest payment, you use it to buy more bonds.
- Besides reinvesting your interest, you buy an additional $A = 3$ thousand dollars worth of bonds per year.

(a) Circle the differential equation that models the above scenario.

$$\frac{dB}{dt} = A - rB; \quad \frac{dB}{dt} = rB - A; \quad \frac{dB}{dt} = rB + A; \quad \frac{dB}{dt} = rA + B; \quad \frac{dB}{dt} = B - rA; \quad \frac{dB}{dt} = rA - B$$

(b) After how many years will you own 100 thousand dollars worth of bonds? (Hint: rearrange your differential equation to the form $dt = \dots$ and then integrate both sides.)