1. $\int \ln x^2 dx =$

A. $x \ln x^2 - 2x + C$

B. $1 - \ln x + C$

C. $\frac{1}{3} \ln x^3 + C$

D. $x \ln x^2 - \ln x + C$

E. $\frac{1}{2}x^2 \ln x - \frac{1}{4}x^2 + C$

2. $\int_0^1 \frac{x-1}{(2x+1)^3}\, dx \approx$

A. 0.333

B. −0.113

C. −0.450

D. −0.167

E. −0.301

3. $\int_2^{\infty} x^2 e^{-x^3}\, dx =$

A. this integral diverges

B. $\frac{3}{e^8}$

C. $\frac{e^2}{3}$

D. $3e^2$

E. $\frac{1}{3e^8}$

4. Use the trapezoidal rule, with $n = 4$, to approximate $\int_1^4 \sqrt{1+2x}\, dx$, rounded to 4 decimal places.

A. 9.0311

B. 4.5156

C. 7.2566

D. 8.0066

E. 14.5132

5. The domain of the function below is the set of all real pairs where

$$f(x,y) = \frac{y\ln(1+x)}{e^x - 1}$$

A. $x > 0$

B. $x \neq -1$ and $x \neq 0$

C. $-1 < x < 0$ and $x > 0$

D. $x > -1$

E. $-1 < x < 0$

6. If $f(x,y) = \dfrac{x^2 - y^2}{3x + y}$, then $f_y =$

A. $\dfrac{-2x^2y + 2y^3}{(3x+y)^2}$

B. $\dfrac{-x^2 - 6xy - y^2}{(3x+y)^2}$

C. $\dfrac{3x^2 + 2xy + 3y^2}{(3x+y)^2}$

D. $\dfrac{-3x^2 - 6xy + y^2}{(3x+y)^2}$

E. $\dfrac{-x^2 - 6xy - 3y^2}{(3x+y)^2}$

7. If $f(x,y) = y \ln x + (x + xy)^3$, then f_x evaluated at the point $(1, -3)$ is

A. -27

B. 9

C. -39

D. 12

E. 33

8. If $f(x,y) = x^3 e^{y^2}$, then $f_{yx} =$

A. $12xye^{y^2}$

B. $3x^2e^{y^2}$

C. $24xye^{y^2}$

D. $6x^2ye^{y^2}$

E. $2x^2ye^{y^2}(3+x)$

9. The daily output at a factory is $Q(x,y) = 180x^{1/3}y^{1/2}$ units, where x denotes the number of supervisor hours and y denotes the number of worker hours. Currently, 27 supervisor hours and 400 worker hours are used. Use calculus to estimate the decrease in output if supervisor hours are decreased by 3 and worker hours are increased by 12.

   A. 6 units

   B. 238 units

   C. 261 units

   D. 286 units

   E. 12 units

10. Use the chain rule to find $\frac{dz}{dt}$ evaluated at $x = 12$ and $t = 4$ if

$$z = 200 - 10x^2 + 20xy \quad y(t) = 12.8 + 0.2t^2 \quad \frac{dx}{dt} = 0.5$$

   A. 424

   B. 248

   C. 210

   D. 280

   E. 320

11. For a function f, $f_x = 2x + 2xy$ and $f_y = 2y + x^2$. The critical points of f are $(-\sqrt{2}, -1)$, $(0, 0)$ and $(\sqrt{2}, -1)$. Classify each as a relative minimum, relative maximum or saddle point.

    A. $(0, 0)$ is a rel max and $(-\sqrt{2}, -1)$, $(\sqrt{2}, -1)$ are saddle pts

    B. $(0, 0)$, $(\sqrt{2}, -1)$ are rel mins and $(-\sqrt{2}, -1)$ is a saddle pt

    C. $(-\sqrt{2}, -1)$, $(0, 0)$, $(\sqrt{2}, -1)$ are all rel mins

    D. $(0, 0)$, $(\sqrt{2}, -1)$ are rel maxs and $(-\sqrt{2}, -1)$ is a saddle pt

    E. $(0, 0)$ is a rel min and $(-\sqrt{2}, -1)$, $(\sqrt{2}, -1)$ are saddle pts

12. A store carries two versions of a video game, a generic version and the latest edition. The profit function, P, has partial derivatives $P_x = -12x+76+4y$ and $P_y = 4x-2y+2$ when the generic version sells for x dollars and the latest edition sells for y dollars. How should the games be priced for the maximum profit?

    A. $x = \$3$, $y = \$14$

    B. $x = \$29$, $y = \$65$

    C. $x = \$14$, $y = \$25$

    D. $x = \$20$, $y = \$41$

    E. $x = \$15$, $y = \$61$