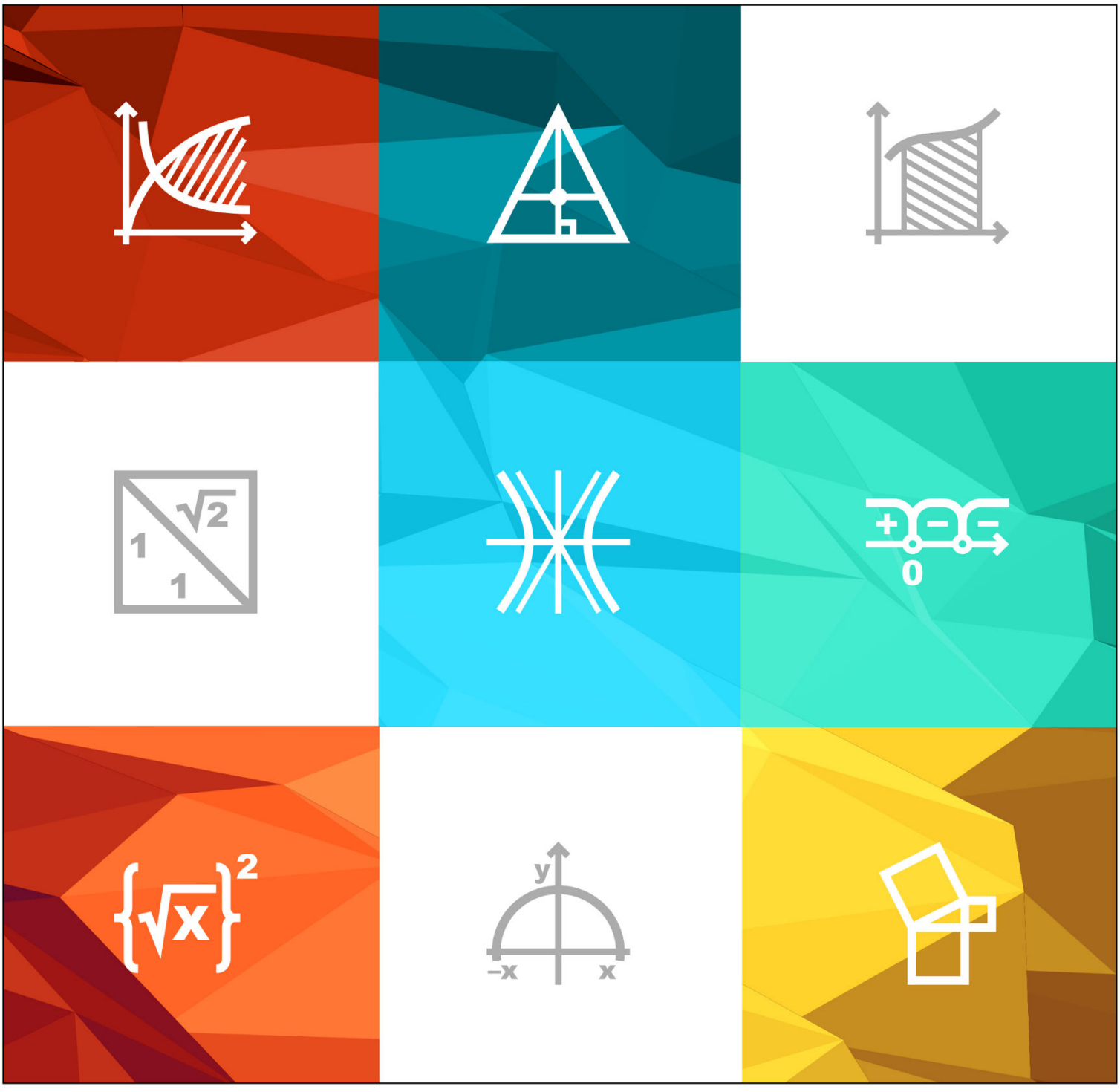
proprep™

Workbook



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Implicit Differentiation

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Questions:

1) Find y', given $x^2 + y^5 = xy + 1$. Compute $y'(0)$.

2) Find $y'(1)$, given $e^{xy} + x^2 y^2 = 5x - 4$.

3) Find $y'(e)$, $y''(e)$, given $2\ln x + \ln y = 1$.

4) Given $z^2 - e^{x^2+y^2} + (x+y)\sin z = 0$ where $z = z(x,y) \geq 0$.
Compute $\frac{\partial z}{\partial x}(0,0)$, $\frac{\partial z}{\partial y}(0,0)$.

5) Given $z^2 - e^{x^2+y^2} + (x+y)\sin z = -e^4$ where $y = y(x,z) \geq 0$.
Compute: $y_x(0,0)$, $y_z(0,0)$.

6) Given $z^3 - 2xz + y = 0$ where $z = z(x,z) \geq 0$. Find $z_{xx}(1,1)$.

7) Given $z^3 - 3xyz = 4$ where $z = z(x,y)$ and $z(2,1) = -2$. Find:

a. $z_{xx}(2,1)$ b. $z_{xy}(2,1)$ c. $z_{yy}(2,1)$

8) If $u^2 - v = 3x + y$ and $u - 2v^2 = x - 2y$, find u_x, v_x, u_y, v_y.

9) If $x = u + v$, $y = u^2 + v^2$, $w = u^3 + v^3$, find w_x, w_y.

Answer Key:

1) $y'(0)=\frac{1}{5}$

2) $y'(1)=5$

3) $y'(e)=-\frac{2}{e^2},\ y''(e)=\frac{6}{e^3}$

4) $z_x(0,0)=z_y(0,0)=-\frac{\sin 1}{2}$

5) $y_x(0,0)=0,\ y_z(0,0)=\frac{1}{2e^4}$

6) $z_x(1,1)=-16$

7) a+b. $z_{xx}(2,1)=z_{xy}(2,1)=1;$ c. $z_{yy}(2,1)=4$

8) $u_x=\frac{1-12v}{1-8uv},\ u_y=\frac{-4v-2}{1-8uv},\ v_x=\frac{2u-3}{1-8uv},\ v_y=\frac{-4u-1}{1-8uv}$

9) $w_x=-3uv,\ w_y=1.5(u+v)$