4. $E(3x^2+2) = 3E[x^2]+2$

$\qquad\qquad = 3\left(\frac{7}{3}\right)+2$

$\qquad\qquad = 7+2$

$\qquad\qquad \boxed{= 9}$

$\boxed{Var(x) = E[3x^2-24]}$
$\qquad\qquad = 3E[x^2]-24$
$3 = 3E[x^2]-2(2)$
$7 = 3E[x^2]$
$\frac{7}{3} = E[x^2]$

5. $f(x) = \lambda e^{-\lambda x} \quad x \sim Exp(0.5) \quad P(x \geq 3)$

$f(x) = 0.5 e^{-0.5x}$

$\int_3^\infty 0.5 e^{-0.5x}\,dx = -e^{-0.5x}\Big|_3^\infty = 0-(-e^{-0.5 \cdot 3}) = .223$

$\boxed{\approx 0.223}$

6. $P(B \cap T) = 0.5 \quad P(B) = 0.6 \quad P(B \cup T) = 0.7 \quad P(T) = ?$

$P(B \cap T) = P(B) + P(T) - P(B \cup T)$

$P(B \cap T) - P(B) + P(B \cup T) = P(T)$

$0.5 - 0.6 + 0.7 = P(T)$

$\boxed{P(T) = 0.6}$

7. 36 possible rolls

6 can be made by: $(1,5),(2,4),(3,3),(4,2),(5,1) = 5$ ways

$36 - 5 = 31.$ On average, it would take us 32 rolls to get a sum of rolls that equal exactly six.

8. $T = x + y + z$

$x = \frac{9+6}{2} = 12$

$y = \frac{7+3}{2} = 5$

$z = \frac{15+16}{2} = 12.5$

$T = 12 + 5 + 12.5 = 29.5$

$\boxed{T = 29.5}$