[15] 1. Answer each of the following questions by checking one or more of the corresponding boxes. Some questions may require you to check more than one box in order to create the most complete and correct statement.

(a) The natural exponential function is an exponential function with base

☐ 10

☐ 2

☐ e

☐ π

☐ none of the above

(b) For any base $b > 0$, $b \neq 1$, which of the following is a property of the function $f(x) = b^x$?

☐ domain $D = [0, \infty)$

☐ range $R = \mathbb{R}$

☐ range $R = (0, \infty)$

☐ an x-intercept at the point $(1, 0)$

☐ a y-intercept at the point $(0, 1)$

(c) $(-32)^{\frac{3}{5}} =$

☐ 2

☐ -2

☐ 8

☐ -8

☐ undefined

(d) $(-16)^{\frac{3}{4}} =$

☐ 2

☐ -2

☐ 8

☐ -8

☐ undefined

(e) $27^{-\frac{2}{3}} =$

☐ $\dfrac{1}{9}$

☐ $-\dfrac{1}{9}$

☐ 9

☐ -9

☐ undefined

[7]   2. Give all solutions t in the interval $[0, 2\pi)$ of the equation

$$\cos(2t) - 2\sin^2(t) = 0.$$

[6]   3. Express $\dfrac{13\pi}{12}$ as the sum or difference of two special angles. Use this expression to find the exact value of $\cos\left(\dfrac{13\pi}{12}\right)$.

[6]   4. Given that $\tan(\theta) = -2$ and θ is an angle in the fourth quadrant, find $\sin\left(\dfrac{\theta}{2}\right)$.

[6]   5. Solve the equation $9^{3-2x} = 3 \cdot 27^{x-3}$.

[40]