Question 18

If $\int_3^8 f(x)\,dx = 10$ and $\int_{10}^8 f(x) = 4$, then $\int_3^{10} f(x) + 1\,dx$ is equal to

A. 6

B. 7

C. 13

D. 14

E. 21

Question 19

The minimum distance from the parabola $y = x^2 - 4$ to the origin is

A. 2

B. $\frac{\sqrt{14}}{2}$

C. $\frac{\sqrt{15}}{2}$

D. $\sqrt{2}$

E. 4

Question 20

Let n be a positive even integer and let $f(x) = n^{n-1}x^n\log_e(nx)$.

The number of stationary points of f is

A. 0

B. 1

C. 2

D. n

E. $n - 1$

END OF SECTION A

e. Let distance = $d(a)$.

$$d(a) = \sqrt{\left(\frac{-a(5a-1)}{4a^2-1}\right)^2 + \left(\frac{4a-5}{4a^2-1}\right)^2}$$ M1

For min/max, let $d'(a) = 0$. M1

$$a = \frac{\pm\sqrt{21}+5}{4}$$

$$= \frac{\sqrt{21}+5}{4}$$ A1

$$d(a) := \sqrt{\left(\frac{-a\cdot(5\cdot a-1)}{4\cdot a^2-1}\right)^2 + \left(\frac{4\cdot a-5}{4\cdot a^2-1}\right)^2}$$

$$\text{solve}\left(\frac{d}{da}(d(a))=0, a\right)$$

$$a = \frac{-(\sqrt{21}-5)}{4} \text{ or } a = \frac{\sqrt{21}+5}{4}$$

$$\text{fMin}(d(a), a) \qquad a = \frac{\sqrt{21}+5}{4}$$

Note: Students may also determine the correct value of a from a graph of the distance function.

f. **i.** $\text{dom}_p = [-1, 1]$

Transformation T_2 represents a dilation factor of a from the y-axis and, as $a < 0$, there is also a reflection in the y-axis.

$\therefore \text{dom}_q = [a, -a]$ A1